# Together and yet apart: Probing non-cooperation in the Herøya Industrial Park

Rhoda Ahoba-Sam

MSc. in Innovation and Entrepreneurship

Faculty of Mathematics and Natural Sciences

UNIVERSITY OF OSLO

20-May-2016

This page has been intentionally left blank

# Together and yet apart: Probing non-cooperation in the Herøya Industrial Park

Rhoda Ahoba-Sam

Supervised by: Tor Borgar Hansen (PhD)

MSc. in Innovation and Entrepreneurship

Faculty of Mathematics and Natural Sciences

University of Oslo

2016

Together and yet apart: Probing non-cooperation in the Herøya Industrial Park

Rhoda Ahoba-Sam

http://www.duo.uio.no/

Printed Reprosentralen, University of Oslo

# Abstract

Cluster theory reveals that, there exist benefits to be gained from inter-firm cooperation. This is suggestive that cluster-related benefits supersede mere co-location, and that firms must actually cooperate to reap these benefits. The aim of this research was to explore factors that must be in place for firms to benefit from co-location, attention paid to benefits derived from inter-firm cooperation rather than the sharing of public goods and infrastructure. This was done employing the case of the Herøya Industrial Park, Porsgrunn-Norway, where firms are reportedly focused on public-goods benefits, to explore inter-firm relations in the Industrial park, regarding the progression of collaboration in the park. Concurrently, Herøya is compared to the Eyde Cluster – Southern Norway, which having recently attained a cluster status, can be described as a step ahead of Herøya regarding cooperation, and is constitute of similar industries. Assessment of Eyde is done in six areas namely; inter-firm linkages, dealing with security, presence of commons, support and cluster constitution, from which three levels of cluster cooperation arise. Results reveal that, while certain factors moderate working together in the Herøya Industrial park, there yet exist features that could serve as a leverage for cooperation. However, considering the need for cooperation at all, it is a finding that with similar features in place that foster cooperation in other places, Herøya may be 'unique' and not presently disposed to establishing the level of inter-firm linkages characteristic of 'working' clusters given that certain factors that justify the need to collaborate must be in place.

This page has been intentionally left blank

# Acknowledgements

I am very grateful to the almighty God through whom all things are made possible for me, and by whose good grace I have come this far. It has not been an easy road, but has definitely been worth my while.

I express sincere thanks to my supervisor, Tor Borgar Hansen (PhD), who has made time amidst a busy schedule to get me headed in the right direction and yet enough flexibility to express my personal options.

I am grateful to all through whom I gathered information both in and out of the Herøya Industrial Park, whose wealth of knowledge made this work possible. I especially appreciate the warmth with which I was received and their eagerness to assist this work, and their personal interest in this research. Odd-Arne Lorentsen (PhD)- Yara, Porsgrunn and Klaus-Joachim Jens (PhD) –USN, Porsgrunn have been especially invaluable in examining this case.

I want to thank all my friends, especially those who still do not know exactly what I have been working on, but nevertheless called to check on my progress. You are very much appreciated.

I appreciate my dear mother, Margaret who has been consistent in checking-in throughout the time of this thesis. Thanks also go to my dear brothers for their support from afar.

Kudos to my husband, Christian and son, Nyansa who have contributed their unflinching support throughout the time of this work and allowing me an 'in-house' holiday as and when I required this to work extra, in order to get me this far.

*The heights by great men reached and kept were not attained by sudden flight, but they, while their companions slept, were toiling upward in the night.*

- Henry Wadsworth Longfellow

This page has been intentionally left blank

# Table of Contents

# List of Figures

This page has been intentionally left blank

# 1 Introduction

*Paradoxically, the enduring competitive advantages*
*in a global economy lie increasingly in local things - knowledge, relationships,*
*and motivation that distant rivals cannot match.*
- Michael Porter (1998)

It is indeed puzzling, that in today's technological world and advanced connectivity, even as the world becomes increasingly globalized, with decreasing transportation and transaction costs, diminishing distances, and global sourcing, that the functioning of clusters is still very relevant. It is easy today to have business partners and other associates overseas, and not be in the same geographic location because of the introduction and brisk improvements in information technology and global interconnectedness. However, there still remains competitive advantage in co-location as far as knowledge, relationships and motivation are concerned, so much so that Porter (1998) argues that, this creates a clear distinction between clusters and *unclustered* rivals. But where really is the line drawn? and, are these benefits simply applicable to any kind of geographic location of companies?

Cluster theory teaches of benefits that companies stand to gain from identifying in a cluster. Co-location is in fact just a start, and not enough for the benefits inherent in clusters to be enjoyed by firms. Firms must actually cooperate in order to benefit from co-location, otherwise, they are comparable to 'lone' or unclustered companies. In other words, companies may be together (physically close), and yet apart (where there exists no cooperation). It stands however that, where this inter-firm cooperation is lacking, benefits may yet be derived from public goods such as sharing of various infrastructure that are generally available in the location.

The Herøya Industrial park located in Porsgrunn, Telemark is one of the biggest industrial parks in Norway. Given its suitable location close to the coast, it is a choice place for export companies and anyone to whom a fast and efficient link to Europe and the rest of the world is important[1]. The figure 1 shows an aerial view of the Herøya industrial park depicted as an island of various industries

[1] sourced from Herøya industrial park website *http://www.heroya-industripark.no/*

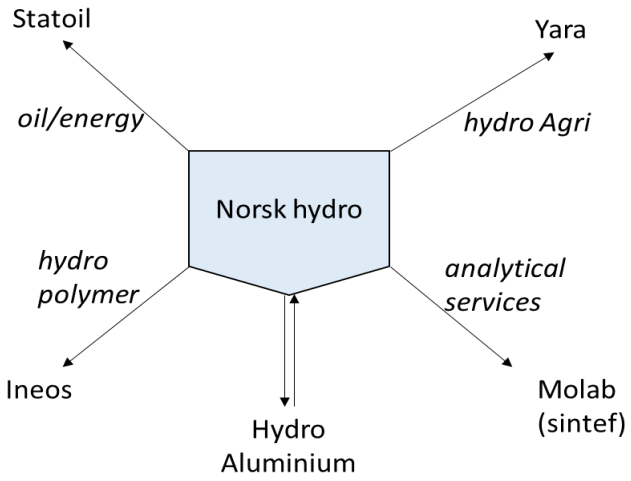
*Figur 1: Aerial view of Herøya Industrial Park*

Even though the industrial park consists of physically proximate companies, the over 80 companies in this park, including major players such as Ineos, Statoil and Yara, reportedly, ***do not cooperate*** in business or innovation. In fact, where non-cooperation exists requires that one is careful to call Herøya a cluster. Put simply as indicative of the nature of cooperation at the industrial park, a worker had this to say:

*''The only collaboration that exists is sharing the same canteen''* - Yara Contact

Further of interest is that, this industrial park evolved from a single company, Norsk Hydro (1928-1929)[2]. Now with former colleagues working in different firms within the industrial park, it is the case that a good number of employees at the park are accustomed to each other having worked together before. As shown in figure 2, the oil and energy, hydro agri, analytical and hydro polymer departments of the then Norsk Hydro split up to become Statoil, Yara, Molab and Ineos, respectively. What remains of the original company is Hydro Aluminium. For the support departments, the former services department of Norsk Hydro is now a part of Bilfinger, while the IT department forms a part of Evry today.

[2] sourced from Herøya industrial park website *http://www.heroya-industripark.no/*




*Figur 2: Evolution of the main departments in Norsk Hydro (1928-1929)*

In the year 2010, Torger Reve, Amir Sasson and their colleagues from the Norwegian business school, BI, conducted a research titled 'Et Kunnskapetbasert Grenland'[3]- *translated as 'A Knowledge-based Grenland'* of the Herøya industrial park plus other Grenland companies. One of the main objectives was to find out the 'cluster effect' as experienced in the Industrial park. This cluster effect was focused on investigating the inter-firm relations that existed between various firms in the industrial park. They discovered that the companies at Herøya indeed do not function as a traditional cluster were more focused on the sharing of public infrastructure.

During her visit to the Herøya industrial park and Grenland Industries in general, the Norwegian Minister of trade and industry, Monica Mæland, in August 2014 clearly spelt out the interest of the government concerning 'increased productivity and competitiveness' in the region and particularly what the government could do in support of the conditions at the Industrial park[4]. Summing up her meeting with managers of the park she said,

*"I think this has given us some good feedback on things we work with."*

*"This feedback confirms that we can facilitate matters for industry even more effectively".*

Among other things, this visit suggests an increased interest of the government in the land-based industry compared to previous years when the interest was majorly placed on offshore activities and, oil and gas.

[3] see appendix D
[4] sourced from Herøya industrial park website *http://www.heroya-industripark.no/*

For anyone interested in cluster dynamics, the case in the Herøya *Industrial* Park is compelling as it raises a lot of questions. Is non-cooperation prevalent because the firms identify themselves as competitors and cannot find a single area where they can cooperate? Where is the limit for cooperation and competition placed? Is cooperation only possible for certain kinds of firms and totally irrelevant for others? Is collaboration in industrial parks or clusters, for that matter, always the way to go? *Are there some conditions or factors missing in this park that are necessary to promote cooperation? Really, what must be in place for firms in Herøya to benefit from cooperation that stems from co-location?* Following from this line of reasoning, the goal of this thesis is to explore the factors that must be in place for co-located firms to benefit from co-location where focus is placed on benefits derived from cooperation and inter-firm linkages, and not necessarily from the sharing of public goods or infrastructure. To be researched thus is the question:

***'What factors must be in place for firms to benefit from co-location?'***

To answer the research question, an explorative study is carried out to investigate the factors that need to be in place to enhance cooperation, by seeking the views of internal and external players of the Industrial park. Here, focus is placed on non-public benefits derived from inter-firm cooperation. This is achieved by adapting a single case study with embedded units approach. The findings from Herøya are further given authentication by comparison with a choice and like cluster setting, Eyde Cluster, which has gone a step ahead as far as cooperation is concerned. In doing so, value would be added to the extant literature on cluster dynamics and agglomeration on generalization of certain prior decided factors that are required for co-located companies to identify as a cluster, being careful to show that what works for one location to become a cluster and cooperate, may not necessarily be transferrable to another location.

After this introductory chapter, the relevant theoretical perspectives are reviewed in chapter 2. Next, the methods employed for this exploration and the reasons for such choices are presented in chapter 3. In chapter 4, results from data collection and subsequent analysis of these are presented. Chapter 5 is the concluding chapter where the findings and analysis are ultimately linked to the research question, and based on which case-relevant propositions are made.

# 2 Cluster theory and inter-firm cooperation

Theory relevant to the given study is presented in this chapter. First, theory on clusters and how they emerge is discussed in section 2.1. Next, cooperation among collocated firms is reviewed in section 2.2. Given the present example of non-cooperation in Herøya industrial park, literature perspectives on what factors affects firms' decision to cooperate or not, is reviewed (section 2.3). Finally, divergent theoretical perspectives on the benefits related to inter-firm cooperation are reviewed in section 2.4

## 2.1 Clusters and how they emerge

Clusters are defined by Porter (1998) as 'geographic concentrations of interconnected companies and institutions in a particular field' (Porter, 1998). On another level, 'clusters may be understood as geographical concentrations of specific industries, and cluster initiatives, understood as more formalized actions undertaken by regional actors' (Kowalski and Marcinkowski, 2014). Clustering refers to 'a process characterized by the progressive agglomeration of a number of firms in a specific location' (Lee et al., 2012).

Often, there could be the existence of clustering which merely refers to firms being co-located, but does not necessarily mean that there actually exists a functioning or working cluster. In support of this, Atherton (2003) proposed that, cluster development could be made up of several phases of emergence and points to three stages of clusters, namely; potential, emerging and established (Atherton, 2003). This implies that clusters exist at varying levels of development and may not show the same characteristics depending on the stage of development. Given that the emergence and evolution of a cluster is made up of intricate phases, it may be rewarding that incorporating historical process can strengthen the practical application and give a wholesome understanding of cluster dynamics (Motoyama, 2008). These ideas on the history of a cluster are essential for the understanding of the entirety of cluster dynamics as it brings into context the factors that may have influenced the evolution of a location of firms into a working cluster or, conversely, a working cluster into a dead or non-functioning cluster. It is of use then to appreciate the stage of progression of a particular cluster in order to understand its processes at a given time.

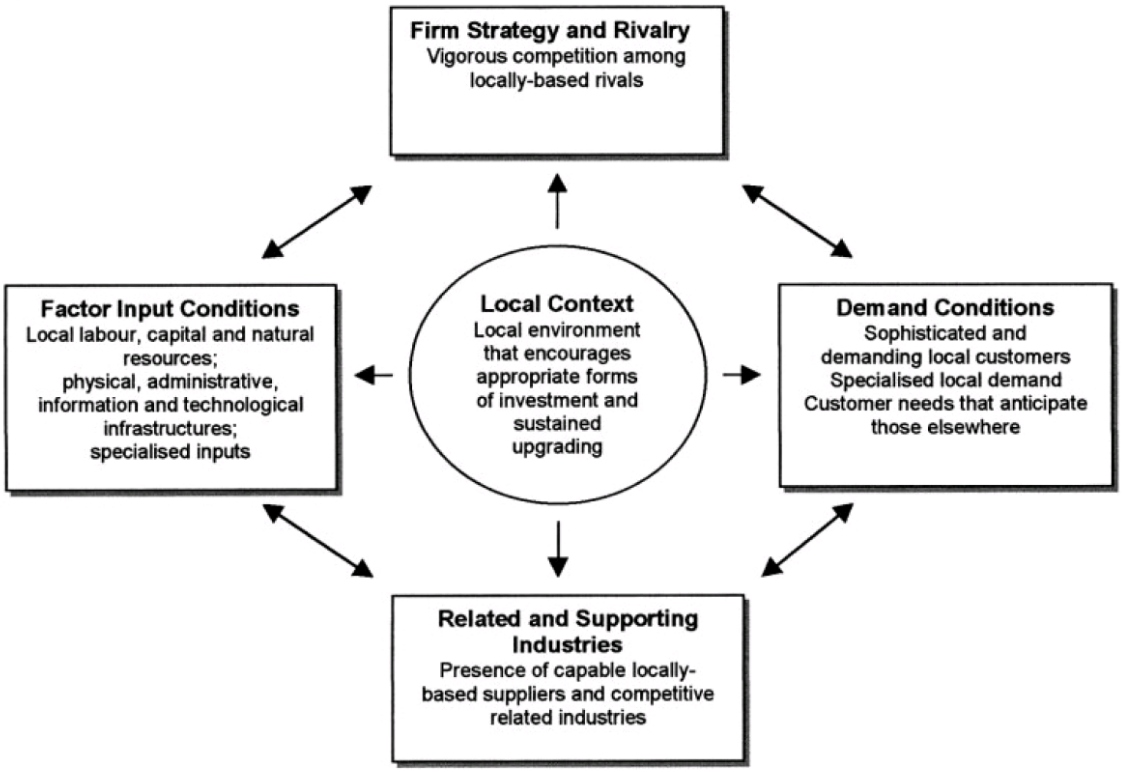
Additionally, the roots of a cluster can often be traced to their historical circumstances that may pertain to where their core business commenced. They could emerge as a result of a national problem, or existence of a naturally occurring facility such as a harbor. Important thus to the location of such clusters is the access to resources that could be human or material, and important for the promotion of the core-businesses of the companies located within the cluster (Atherton, 2003).

Inferring from Porter's definition of clusters, the geographic co-location of companies further requires that there is some sort of interconnectedness between the companies and institutions in a particular field for the picture of a 'cluster' to be complete. Drawing from this understanding, and in particular for the purpose of this study, *an industrial park would be defined as a location earmarked for industries and their consequent development,* whereas an *industrial cluster would refer to a similar setting of industries that are co-located and enjoy some level of interconnectedness and cooperation for mutual benefits* (Porter, 1998).

Porter (1998) developed the concept of the 'competitive diamond', which separated out four sets of factors, as shown in figure 3. He explained that these factors, listed below, determine the success of a nation's firms.

1) Factor (input) conditions (i.e., resources and infrastructure in a certain location that may be improved in quality and specialization for certain cluster areas)
2) context for firm strategy and rivalry
3) demand conditions
4) related and supporting industries (i.e., high productivity of local clusters is driven by a high local rivalry, local customers with a high degree of sophistication as well as the competitiveness of local suppliers and related businesses).

Ported went on to argue that the intensity of interaction within the 'diamond' is enhanced if the firms concerned are 'geographically localized' or 'clustered'. This implies that, firms that are related and proximate have more perceived benefits as compared to related but distant firms. In support of this, Battaglia et al. (2010) proposed that, 'in a cluster, social capital is strengthened by the proximity of firms, the availability of local resources, and close correlation with local institutions' (Battaglia et al., 2010).




*Figur 3: Porter's competitive diamond model, based on Porter (1998)*

Following from Porter's definition of clusters, he explains further that, within a cluster exist an array of linked industries and other entities that are important for competition. This definition of clusters lends itself well to the understanding that, not only should companies be proximate, but there should exist a connection or link between them. In an example of the Italian leather cluster, Porter (1998) explains how the existence of multiple links and synergies that participating businesses enjoy has contributed in part to the 'extraordinary strength' of that cluster (Porter, 1998). This suggests that, for co-located firms, being proximate to others is just the start. To benefit from the co-location, there should be some cooperation between the firms.

Another way industrial clusters emerge is through spin-offs, joint ventures, partnerships, and break-offs. When employees break-off from firms, they are likely to locate their new firms close to former employees probably due to reasons including a variety of cost considerations and if this goes on for some time, industrial clusters emerge (Lee et al., 2012). This example of cluster emergence implies that, the resulting companies and firms may more likely be involved in

businesses that are similar, which would serve for the existence of competition- a good incitement for the firms involved to be more innovative so as to stay on top.

According to Horaguchi (2008), collaboration in knowledge gives rise to new patterns of competition, since knowledge is created with cost in an organization but is transferred without additional cost under a collaborative agreement. 'When a significant number of markets are connected to form a network, c*luster competition* leads to uneven production levels in each market. An industrial cluster emerges even if markets are evenly connected with identical conditions' (Horaguchi, 2008).

## 2.2 Cooperation among co-located firms

A functioning cluster among other things, offers its members access to employees and suppliers, specialized information and complementarities which invariably influence a firm's productivity (Porter, 1998).

Regions are competitive when the prosperity of firms depends on region-specific intangible assets. These assets may be embodied in a knowledge and competence base with a high degree of tacitness, and are sustained and reproduced based on specific interactions characteristic of a particular institutional setting (Boschma, 2004). Assets that are found in a region, and for which the competitiveness of the region exist, are non-tradable and hard to replicate or transfer to other places (Boschma, 2004). They are region-specific.

These assets thus can be explained to offer certain opportunities and constraints that may decide the interest of local firms, and the springing up of others whose competencies fit into the local context or specifications. Firms who are 'unfit' as far as these interests are concerned become excluded from competition. These assets, because they may be intangible in nature, exclude other non-competent firms who have neither found the resources to imitate a particular technology.

Hoekman et. al. (2010) discovered that the preference to collaborate with physically proximate partners did not decrease, while collaboration within territorial borders decreased over time. Results showed that removing territorial borders, does not render collaboration less sensitive to

physical distance. ‘Given this general trend, there is considerable heterogeneity between regions and countries in their propensity to collaborate which we attribute to differences in size, quality and accessibility’ (Hoekman et al., 2010).

In a study to examine the performance of firms that concentrate geographically, compared to their more dispersed counterparts, Diez-Vial (2011) argued that while belonging to an agglomerated space may have positive externalities for proximate firms, there can also be congestion economies that may counterbalance these advantages. The results from a quantitative study of the Iberian Ham cluster showed that, as the number of neighboring firms increased, firms’ performance also increased. This development was credited to access to valuable resources, workers, higher demand, knowledge spillovers, and lower transaction costs (Diez-Vial, 2011).

Larger firms can make stronger local investments and contribute to external information and knowledge spillovers that small firms can benefit from (Diez-Vial, 2011). Firms belonging to networks of local job mobility significantly outperform other similar firms within the local labour market (Eriksson and Lindgren, 2009).This implies that in a location of small and large companies, there is a benefit in networking that firms outside cannot derive.

Networking locally increases region-specific knowledge-stock, leading to a comparative advantage (Soetanto and Jack, 2013). However, if efforts are directed toward inferior solutions, it might also lead to a lock-in situation (Graf, 2011) . Thus, while firms cooperate locally, they have to be mindful of advancements in technology outside their location so that they could remain competitive. For this reason, external input is important and this is best served by public research organizations, which could be referred to as technology ‘gate-keepers’. These ‘collaborations in knowledge’ within the region lie in reciprocity. One sells into the target market and accepts the opponents selling into his own market. (Horaguchi, 2008)

Company managers who fail to consider symbiotic solutions for resource issues risk overlooking the most effective strategic options (Chertow and Miyata, 2011). This implies that, companies are better off acting collectively in sharing resources rather than acting individually. There is a significant difference in perceptions of shared resources between cluster and non-cluster firms. When comparing the means of six categories of shared resources, it was found that the means of shared resources in cluster firms are significantly higher than in non-cluster

firms, thereby providing further evidence on the existence of shared resources in industrial clusters (Li and Geng, 2012)

Studying Toronto's electronics cluster, a region with an intriguing mix of different types of domestic firms and foreign affiliates, Britton (2003) showed that there are certain bonds that sustain a cluster, the knowledge of which make the strength and weaknesses of clusters understandable (Britton, 2003). This suggests that in a location of very diversified firm types, there could exist certain bonds that would enhance knowledge flow.

In their study of *Clusters or un-clustered industries*, Felzenstein and his colleagues assessed managers' perceptions of the benefits and opportunities of inter-firm cooperation in strategic marketing activities, through a survey involving managers from three key natural resources-based industries. A key finding was that, managers of firms which are part of clustered industries tend to perceive more benefits and opportunities for inter-firm cooperation in marketing activities (Felzensztein et al., 2012). Industries cluster locally in order to collaborate within production channels, transfer knowledge through labor market relationships and in order to partner with governments and unions. 'This transferability of labor opens opportunities for dynamic efficiency through cross-fertilization of skills and techniques'(Felzensztein et al., 2012).

An active role in the cluster system could be played by the so-called 'intermediate institutions', such as trade associations, business consortia, chambers of commerce. These institutions have a primary role in industrial clusters, with reference to the integration of local and social values, that could also lead to the implementation of Cooperate Social Responsibility (CSR) policies and initiatives among firms in a cluster. Research has proven that, though with its attendant advantages and disadvantages, the construction of cluster associations may contribute to inter-firm interactions (Ahedo, 2004). This is a very important concept for many cluster settings especially for those who may believe that there is really no link between their core businesses. Interestingly through informal meetings facilitated by these cluster associations, one may be lucky to come across useful information that may link their firms. On the other hand, being in contact with others working in close industries may be a good recipe to get useful business ideas

For organizations operating in the local productive system (micro level), adopting the cluster approach resulted in overcoming the barriers that prevent them developing systematic CSR initiatives (costs and complexity of the operation) (Battaglia et al., 2010). Small and Medium Enterprises (SMEs) involved in the project clearly expressed this need, and the opportunity of a coordinated approach was identified as interesting with positive effects perceived from both economic and organizational points of view.

A cooperative approach helps to exploit the opportunities to share, the burden of innovation and development within the cluster, interacting with the same public authorities and social stakeholders, and also improves the coordination of the management of CSR-related issues (diversity management, health and safety of the workers, guarantees on child labor or illegal subcontracting, waste separation, collection and recovery, water sewage collection and purification, etc.) and of specific production phases (supply-chain management, investment planning, common audits, etc.) (Battaglia et al., 2010). Further, the cluster may be tasked with the role of being a regional innovator in a particular area, producing high-value-added end use products that may be made use of by others.(Hill and Brennan, 2000)

Innovation and cooperation have been found to be involved in the appearance of local industrial clusters, and conversely to be absent in the disappearance of the same (Brenner, 2005). Having companies in the location actually cooperate fosters thought on improvement of existing means of business processes and how waste could be reduced across the value chain. Through this way of thinking, it could be interesting to find that a 'waste' product from one production line could just be the needed 'raw' material for a process in another firm in the cluster. This way, companies mutually benefit and are also environmentally friendly in an innovative way. These invariably support the importance of cooperation for co-located firms. In a study by Isaksen and Onsager (2010) of Norwegian industries, most of the firms confirmed that innovation was important and were integrated in complex, multi-level systems of knowledge searching and innovation cooperation (Isaksen and Onsager, 2010).

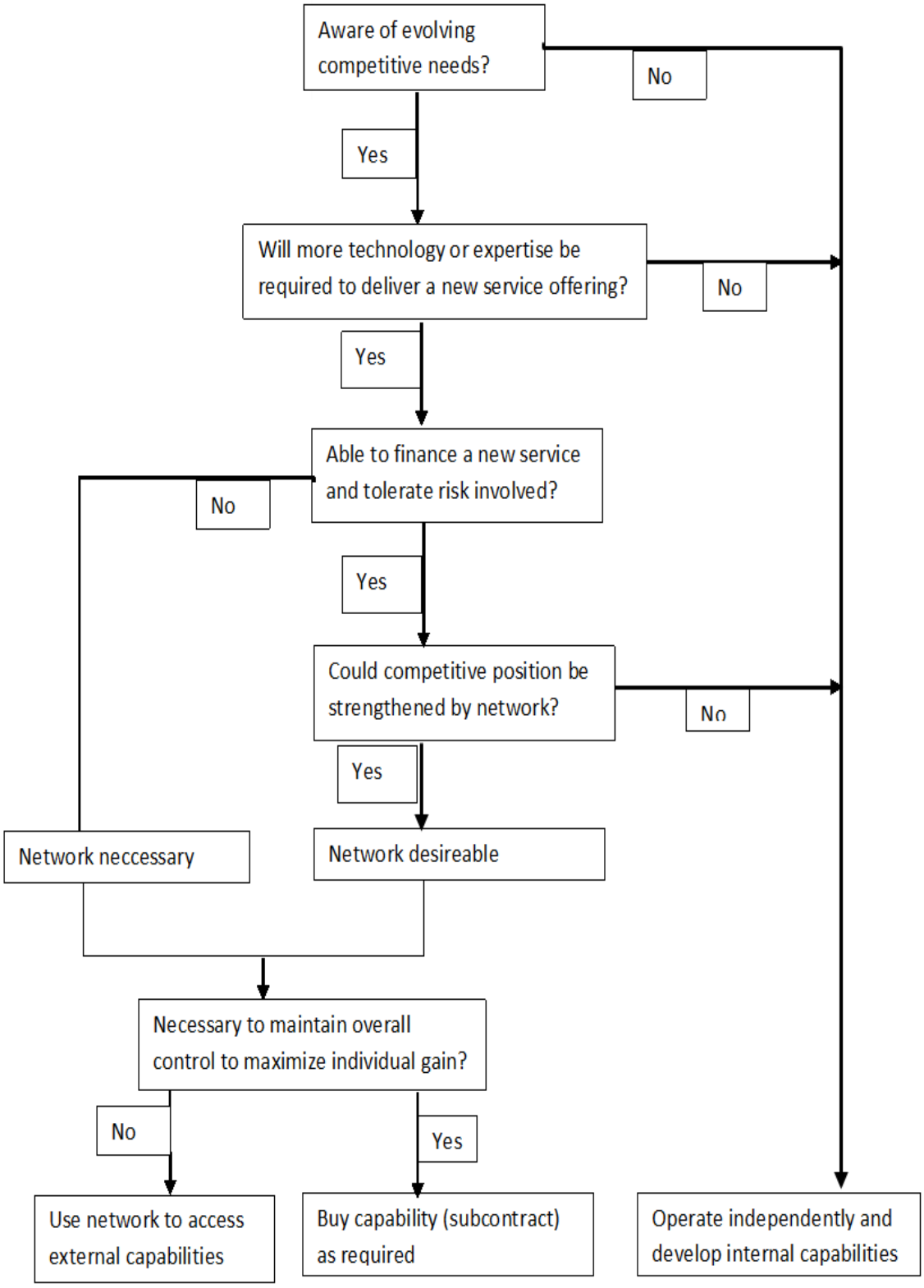
David Newlands (2003) explains the competitive advantage of clusters in relation to transaction costs when he proposes that, transaction costs are lower for cooperating firms in clusters. This is an advantage that is considered to outweigh any increase in production costs. Further, being in close proximity and connectedness to other firms enhances innovation and business

formation. He further credits the existence of frameworks and necessary coordination for innovation to both cooperation and competition. This suggests that, competition and cooperation may not be polar ends, but may actually re-inforce each other (Newlands, 2003, Porter, 1998, Ginsberg et al., 1998, Weidenfeld et al., 2014, Wu and Xu, 2008, Harrison, 1992). Fierce competition between the businesses in a cluster may serve as an attraction of the best human resources to cluster companies (Gretzinger and Royer, 2014). Evaluating the role that competition plays where cooperation exists, Porter put it simply, 'competition and cooperation can co-exist because they occur on different dimensions and among different players'(Porter, 1998).

## 2.3 To cooperate or not to?

Following from the benefits that literature proposes that firms gain from cooperation, it is surprising that some firms, both clustered and unclustered would choose not to cooperate. This line of reasoning suggests the existence of certain factors that could facilitate or deter cooperation and thus lead to the success and proper functioning of co-located firms as a cluster.

While cooperation is important for co-located companies, firms go into cooperation for certain perceived benefits and do not just co-operate for the purpose of doing so. 'Unless there were other tangible or intangible benefits to working symbiotically, the company would seek whichever solution was most profitable' (Chertow and Miyata, 2011). If a more beneficial symbiotic relation exists outside a given location, firms would rather seek those options. In a study evaluating networks among small manufacturing firms it was found that all firms engaging in a network did so for a certain perceived benefit (Hanna and Walsh, 2008). In figure 4, adapted from Hanna and Walsh (2008), it can be seen that some perceived benefits of networking are the enhancement of competiveness, access to technology and experts, access to financing and the ability to moderate risks. This suggests that firms actively consider their options before deciding to enter into networks, and would do so in those instances when their overall competitive position could be enhanced.




*Figur 4: Firms' decision to co-operate or not, adapted from Hanna and Walsh (2008)*

Conditions that are necessary for a successful cooperation for industrial clusters include '(1) infrastructure; (2) institutional framework (legal system, participatory actors, coordination among actors, and so on), and; (3) government support in terms of laws, taxation and finance' (Peng, 2007). Further, in consonance with work by Felzenstein et. al. (2012), the decision of firms to cooperate is largely dependent on the existence of 'commons'. These commons are various tangible and intangible things that firms could depend on, and which could stem from external sources or from within the clustering of firms (Felzensztein et al., 2012, Giuliani, 2011, Graf, 2011, Morrison and Rabellotti, 2009, Wu et al., 2010).

Further, David Newlands explains that it is advantageous for cooperation when there exists some 'commons' of labor supply, infrastructure and business services, more likely where these common services are concentrated locally-but not confined to these circumstances (Newlands, 2003). In their study on Industrial clusters, shared resources and firm performance, Li and Geng (2012) proposed that, there are 6 categories that can properly conceptualize cluster shared resources, namely: common reputation, exchange and combination of knowledge, mutual trust, collective learning, co-petition and local institutions. They further proposed that, if cluster policy could be focused to these aspects of shared resources, firm productivity would be enhanced (Li and Geng, 2012).

This thought on commons was also supported by Kukalis (2010) when he related the sharing of certain common infrastructure and knowledge to be a competitive advantage for cluster firms. Following from postulations from other researchers, he says, 'When the factors of production are geographically concentrated, firms enjoy the additional benefits of spatial proximity' (Kukalis, 2010).

In their study, Felzensztein et al. (2012) found out that length of relationship, which implies trust, was important for the existence of cooperation between both clustered and un-clustered firms (Felzensztein et al., 2012). While firms within a network of trust benefit from the reciprocal exchange of information, especially tacit information, they are simultaneously bound by ties of obligation which regulate behavior. 'Trust thus reinforces mutually beneficial relationships between firms' (Newlands, 2003). These ideas suggest that clusters do not always work and thus the need to put systems in place to ensure as much positive outcome as possible,

and like many other endeavors based on relations, a good foundation based on trust must be in place.

Business incubators are similar to business clusters as far as spatial representation and the benefits derived from interconnectedness are concerned. A business incubator is, 'a 'producer' of business assistance programs' with the advantage of having the incubator company and management in the same spatial location' (Rice, 2002). It has been discovered that cooperation in incubators could result in the stealing of ideas rather than helping to build the future of a firm. In this study it was found out that, trust was very important for cooperation to happen (McAdam and Marlow, 2007). This knowledge is important to appreciate what creates the limits to cooperation and a good factor that influences the choice of a particular firm to cooperate with. Firms have trade secrets that may make them careful in choosing who to cooperate with. To do this, it must be a tried and tested firm who they know is not just interested in a selfish benefit, but who can actually be dependable and reliable. Once this trust is established, other firms in the cluster hear about it, and this could cascade into other beneficial business cooperation. On the other hand, 'if trust goes sour, others in the cluster would still get a wind of it' (McAdam and Marlow, 2007).

Saxenian (1994) adds that it is in the best interest of firms to obey the rules of the game where inter-firm cooperation exists to allow for continued indulgence (Saxenian, 1994). Further, because news about mistrust travels fast within the cluster, it follows then that, even before firms begin to cooperate, especially where tacit knowledge transfer is involved, there is the need to establish inter-firm trust, which continues to be tried and tested in the course of cooperation.

## 2.4 Agglomeration theories

### 2.4.1 Multi-perspectives

Martin and Sunley (2003) conducted a research titled, 'Deconstructing clusters: chaotic concept or policy panacea?' concerning the definition of the cluster concept, its theorization, its empirics, the claims made for its benefits and advantages, and its use in policy-making. Here, the cluster approach is referred to as a 'brand' which has attracted a lot of buyers, but concerning

which they explain that, given such an elastic definition of clusters, it cannot provide a deterministic model on how agglomeration is related to regional and local economic growth (Martin and Sunley, 2003) This is because regarding the definition of clusters alone, there are many differences adopted by different experts. Secondly, because there is an association between some high-growth industries and various forms of geographic concentrations does not necessarily mean that this concentration is the main cause of their economic growth and relative success (Martin and Sunley, 2003). In view of the above, they call for more 'cautious' and 'circumspect' use of the cluster concept.

In their article on agglomeration and firm performance, Knoben et. al. (2016), allude to the fact that 'One firm's medicine is another firm's poison' where they explicitly explain that while some firms would benefit from agglomeration, others would be harmed by it (Knoben et al., 2016). A finding from their research is that, the effects of different agglomeration dimensions, such as urbanization, specialization and knowledge intensity, on firm performance are 'strongly and nonlinearly' moderated by firm characteristics. Further they explain that, this moderation effect is not uniform across the agglomeration dimensions. This suggests that, certain innate characteristics of firms which could be expressed in different firm cultures influence the benefits and to what level agglomeration may have on a performance.

In a study titled, 'Where Is the Value Added in the Cluster Approach?', Brenneworth and Henry (2004) describe the cluster approach as a 'work in progress', with the potential to 'drive forward diverse theorizing on industrial agglomeration' (Benneworth and Henry, 2004) . The mix of success and failure characteristic of the cluster approach history, they explain, is not unimportant but a hallmark of the creative process of theorization in action. The process of adapting and getting conversant with the cluster approach seems thus to be undergoing some 'trial' and 'error' period after which a decided theory on the approach may emerge.

# 3 Methodology

This study paramountly employed the use of a qualitative study approach, and specifically a *single case study* with *embedded units of analysis*.

This section outlines the reasoning behind the choice of methods (section 3.1). The reasons for the choice of research strategy (section 3.1.1) and research design (section 3.1.2) are explained in detail. Section 3.2 on data collection is concerned with the exact approaches employed in order to collect data, specifically data collection methods (section 3.2.1), project rules (section 3.2.2), data processing (section 3.2.3) and how quality was achieved in this study (section 3.2.4).

## 3.1 Choice of Methods

According to Yin (2002), important to the decision on what type of research method to use are the following three conditions, the:
a) type of research question posed,
b) extent of control an investigator has over actual behavioral events, and
c) degree of focus on contemporary as opposed to historical events.

Typical case study questions are framed as 'why' and 'how' question (Wilson, 2014, Yin, 2002). Further explanation however revealed that, the nature of research to be carried out determines the type of method that can be used (Yin, 2002). In line with this also is that, the type of research question posed determines the specific methods to be used, so that there is really no need to 'force-fit' the research question into some prior-determined research method (Shavelson and Towne, 2002). These facts consequently required that analysis of the particular research question and thus, the nature of the study to be carried out be revisited to justify the chosen method.

### 3.1.1 Choice of Research Strategy

The research question on hand, ***'What factors must be in place for firms to benefit from co-location?'*** being a 'what' question may suggest that a quantitative approach should have been carried out. However, this study was not focused on a poll or prevalence of factors, or

probability information on opinions, attitudes, views, beliefs or preferences that co-located firms must possess to benefit from each other. Rather, the study was focused on probing answers to questions on experience, meaning and perspective, from the standpoint of the participants for which reasons a qualitative approach was considered most appropriate (Hammarberg et al., 2016).

Further, given that the particular conditions to make these benefits happen for the chosen case were unknown, a quantitative study could not be used which requires that the constructs or concepts are known prior to investigations. The study *explored* the particular case of the Herøya Industrial park, compared it with a similar setup of 'clustered companies - Eyde cluster', to better understand how firms in the location could benefit from inclusion given certain unknown conditions. This placed the research question as the first type of 'what' questions which according to Yin are exploratory in nature. The research question also placed the research as a case study because the investigator had no control over behavioral events and was focused on contemporary events.

### 3.1.2 Research Design

#### Pass or Fail Criteria of Research?

As posited by Yin (2002), an exploratory study may or may not have propositions, which have the function of directing attention of the research to something to scrutinize within the scope of the study (Yin, 2002). The absence of propositions was adaptable to this research, where the investigator explored all the available factors that answer the research question. But on what basis was the research going to be judged successful? To this end, the research concludes with proposals that could serve as the basis for future work. In supplying these proposals, a pass or fail criteria of having actually suggested *'factors that must be in place for firms to benefit from co-location'* in answer to the research question, is satisfied.

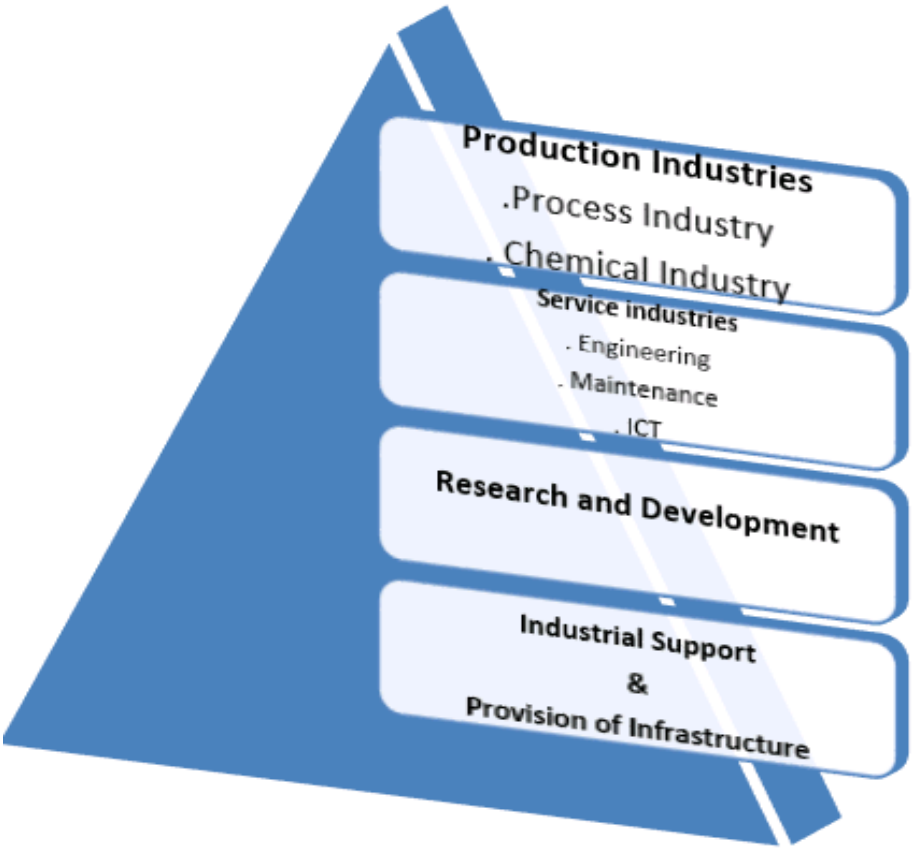
#### Unit of Analysis

Following from the research question, the *individual firms/institutions* were the embedded units of analysis based on which case-relevant deductions would be made in relation to the whole

unit, Herøya industrial park and thus linking the research question to the collected data and ultimately to the conclusions.

As shown in figure 5, the choice of 'individual firms' to include in the research was further based on:

1. industry classifications located at Herøya
2. inclusion of both 'new and old'[5] firms at the park
3. inclusion of both relatively 'large and small'[6] firms based on employee count
4. inclusion of the business incubator as a link to start-up firms in the park and the pilot arena
5. inclusion of the research-focused firms (R&D)

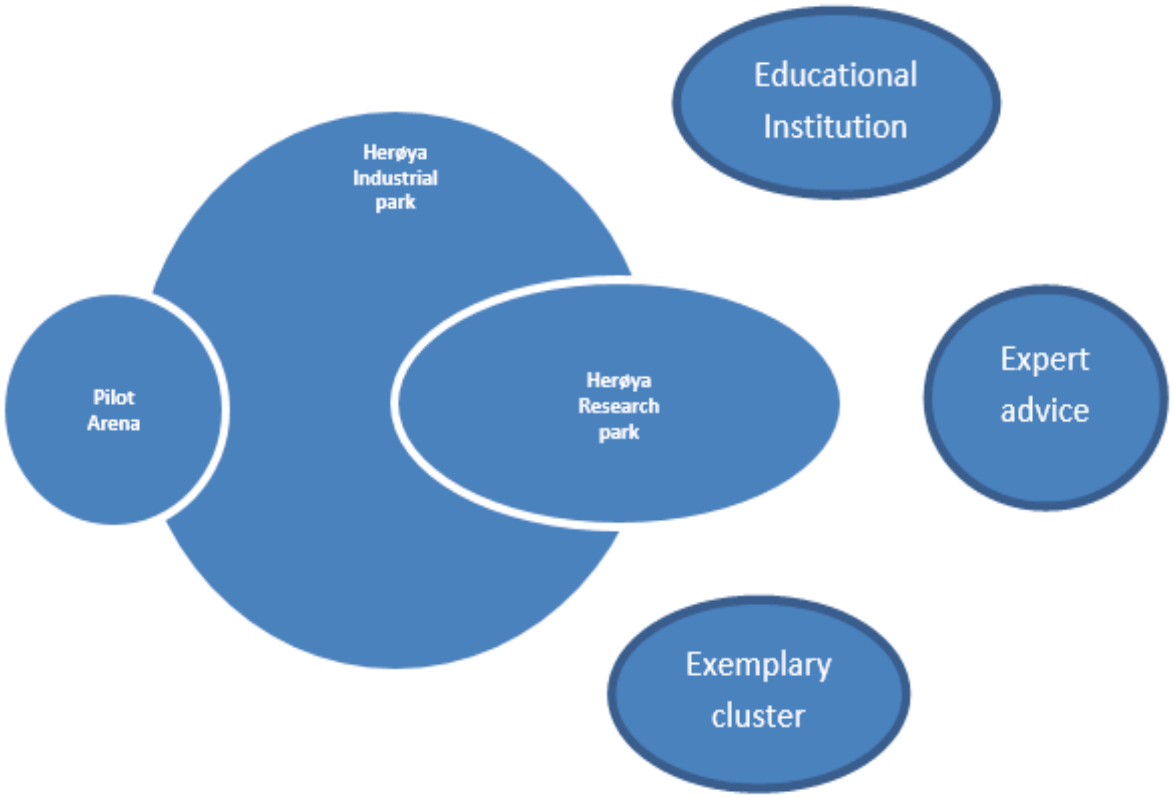



*Figur 5: Industry classifications for data collection*

[5] New and old firms consisted of firms that were 3 years and below, and 4 years and above respectively (considering that certain firms had been in the park from Norsk Hydro days)
[6] Large firms were considered those with 50 and above employees, whereas all others were classified as small.

Apart from the individual firms in the park, the research question was considered in relation to cluster theory. Following from the usual players in a cluster network, it was necessary to include a couple of external players that would be necessary for a complete picture of cooperation in the industrial park; namely an educational institution, a source of expert advice and an exemplary cluster. By analyzing these units as well, an attempt could be made at finding out not just internal factors that needed to be in place for the industrial park, but also external factors.

This data-collection model of the Industrial park is illustrated in figure 6, where Herøya is composite of the Industrial park (including the producing industries), research park (including the R&D-focused firms) and pilot arena (where testing of ideas is carried out before scaling to commercial levels).




*Figur 6: Internal and External players in a cooperating system*

### External comparison - Eyde cluster

The choice of a cluster of comparison was based on improved or 'working' inter-firm cooperation. Just as was investigated for Herøya, the factors necessary to make co-location beneficial were explored, in other words this example of a working cluster was studied within the context of the original purpose of this research.

Eyde cluster, having recently achieved the cluster status, 'From a business network to an innovative cluster in a national innovation system', was a good comparison for the purpose of this study given that it also consists of similar industries like Herøya (Process Industry companies and related suppliers).

## 3.2 Data Collection

Contact with the Herøya industrial park, Porsgrunn was first made in July 2015 following a personal interest in clusters and how co-located firms relate. This contact, both through mails and telephone conversation was very necessary in arriving at the context of the study, and in the form that it was carried out. Serving as part of feasibility studies, it was a first-hand probe into the state of inter-firm relations that existed within the industrial park, revealing that though co-located, the companies benefited mainly from public goods or infrastructure such as a 'common canteen'. In other words, the companies did not cooperate and thus Herøya could not be placed as a 'traditional cluster' which requires cooperation of industry firms in a common value chain. Further, literature review was conducted and some secondary information gathered on the industrial park to gain more understanding into the way Herøya functioned. These feasibilities fed directly into a thesis proposal in Dec 2015.

### 3.2.1 Data Collection methods

Having placed the type of research as qualitative, and further to be treated as a single case study with embedded units, data was collected in the following ways:

1. Interviews were conducted with firm contacts to explore the research question.
   Given an explorative research, a semi-structured interview approach was adapted for all interviews. This approach was useful because question probes such as 'why' and 'how' could be used to gain in-depth understanding of the research themes.

A semi-structured approach also allowed for much flexibility in the line of questioning, and in this way more findings could be made. According to Hammarberg (2016), this approach is advantageous when seeking views on a focused topic or with key informants, for background information or an institutional perspective, which fit well into the design of the research (Hammarberg et al., 2016).

2. Document obtained from firm contacts were also reviewed to gain more insight. Other document were obtained from internet sources and applied where they yielded useful information. By analyzing 'texts and documents', government reports, media articles and websites, this method is a valuable source of triangulation using secondary information and also an opportunity to learn about both distributed and private knowledge of the firms (Hammarberg et al., 2016).

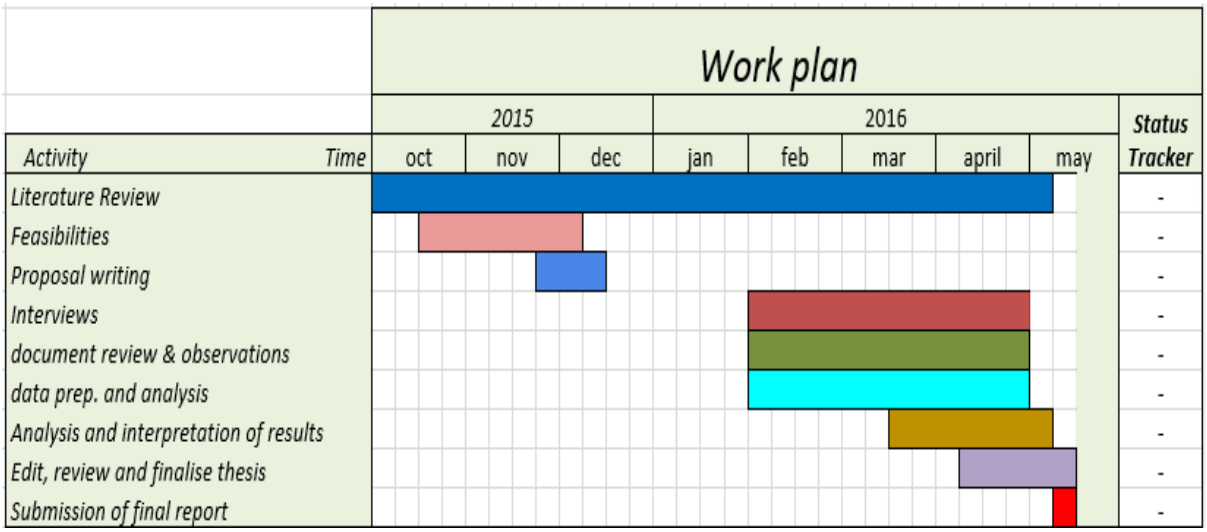
3. An observation activity was one possible way to gather information on how the employees in the Industrial park related to each other, and also to probe any form of 'across-firm' discussions. This was planned to be carried out especially at the canteen of the Industry Park to investigate information gathered about how firm employees, though using the same canteen, would actually do so in a segregated fashion.

   This activity was however not carried out because employees at the park are not 'specially' dressed based on the specific companies they work with, except for a few maintenance firms. In this way, deductions could thus not have been made without interference from the investigator's personal judgement.

4. No survey was carried out in this study given that the constructs of the research question at hand were not prior known as characteristic of an explorative work. A survey could also not afford the investigator opportunity to dig down into points that would be raised by the individuals contacted.

## Work Plan

Literature review was majorly done throughout the entire duration of this project; to satisfy the chosen context of the thesis, and also to compare and contrast findings from data collection. Data collection essentially was carried out in February, March and April 2016, alongside of which analysis was started. So that, at the end of April 2016, all data that had been gathered were also treated into analyzable form and interpreted. This was an exciting way to work given that, literature could be further reviewed on upcoming themes of the exploration to add wholesomeness to the study as well as develop sharper insights. Figure 7 below shows the work plan for this study.




*Figur 7: Work plan of thesis*

### Interviews

All interviews with the chosen firms and institutions in Porsgrunn were done face-to-face, and within an average time of 45 minutes.

Interviews with the cluster of comparison were done through telephone and exchange of e-mails. Whereas face-to-face is the richest way to collect data for its advantage of evaluating both verbal answers and bodily movements or facial impressions, that was not replicable in these two instances due to issues of availability and proximity (Wilson, 2014).

Interviews were conducted according to a guide[7] prepared for the semi-structured interviews at the time agreed to by the interviewees.

### Interview Guide

To understand the presence or absence of cooperation among the Industrial park firms, and appreciate why that was the case, questions relating to the existing form and mode of cooperation were asked. To probe into the criteria used in choosing the existing cooperations, questions were asked to justify a particular choice of a firm to co-operate with. Further, questions explored if these partners were within or outside Herøya and based on what these choices were made. To satisfy that the existing level of cooperation was not history-dependent, interviewees were asked if the existing situation of cooperation had always been the case, or if it had actually been better or worse in the past.

Next, two things had to be assessed:

1. the factors that are mitigating cooperation and to appreciate factors that must be put in place to make this picture better, that is, to make cooperation happen, and
2. if cooperation is the way to go, and if it could ever happen for firms in this industrial park

Questions were thus asked generally on promotion of cooperation as from the perspective of the interviewee. These questions related to what was lacking as far as cooperation was concerned, and if their presence would mean a better form of cooperation. Further asked was if cooperation would benefit their individual firms and how, and why that was their thought.

To the cluster of comparison, information relating to how their firms worked together presently and what was done to achieve this were asked. In the view of continuous improvement, what was being done to further improve the existing level of cooperation in this cluster, was also assessed.

[7] Refer to interview guide in appendix A

### Document Review

Document available[8] of the topic of cooperation were reviewed as provided by the firms and institutions of interest to the study. These comprised of reports of efforts that had been tried to enhance cooperation, studies that had been conducted by external bodies on cooperation at Herøya, presentations on the organization of the firms in the industrial park and print-outs of certain agreements between the firms and the educational institution in the area. Additionally, the websites of the firms investigated proved to be a useful source of information.

## 3.2.2 Project Rules

To protect the interest of both interviewees and investigator, certain project rules were employed, namely:

1. each 'face-to-face' interview was recorded with permission from the interviewee for the sole purpose of further analysis by the investigator and to avoid missing out on salient information as expressed by the interviewee[9]
2. information to be shared directly, 'word-for-word', from interview transcripts were to be done with permission from the interviewee where the request was made and has been duly adhered to
3. where data and figures from company document are used, permission has been sought from the provider of such information and not shared anywhere else
4. analysis of data has been done alongside collection to allow the investigator enough time to process data and to keep to the project timelines. This has especially been helpful where there has existed some waiting time in trying to convene an interview.

## 3.2.3 Data Processing

Data obtained was transcribed for all interviews so as to have them in a common form and structure that would be easy to understand. The transcribed data was then coded using common themes that came up from the interviews in direct and indirect answer to the research question, and other information of importance to the research. To avoid missing out salient points raised,

[8] Refer to Appendix D on secondary document reviewed
[9] Interview transcripts are not attached to this document in order to preserve the anonymity of interviewees

all themes that arose were considered. These were then analyzed in answer to the research question.

An inductive approach, which requires that all emerging factors are considered, was used in the analysis and interpretation of data. This was necessary to allow for maximum flexibility in identifying all contributors to the identified research problem and to avoid elimination of potentially useful information (Wilson, 2014).

Both interviews and document review, as well as other secondary data used allowed to vary the data source. Triangulation of data was further obtained by contacting at least 10 firms in the industrial park. These companies covered the diverse industries represented in the park[10].

### 3.2.4 Achieving Quality of Research

*Trustworthiness (Construct Validity)*

To satisfy this criterion, the purpose of the research, how it was conducted, procedural decisions, and details of data generation and management have been transparent and explicitly explained. In doing this, a reviewer should be able to follow the progression of events and decisions and understand their logic because there is adequate description, explanation and justification of the methods employed (Kitto et al., 2008)

*Credibility*

Interpretation of data has been relayed substantially and verbatim quotations from the data are supplied in support of such where necessary, and agreeably congruent with such interpretations (Sandelowski, 1986). Credibility was further achieved through the use of multiple sources of evidence (data triangulation) and reviewing the draft case study report with key 'contacts'[11] during the data collection and composition stages respectively (Yin, 2002).

[10] See appendix B on company groupings
[11] These key contacts are key informants from the industrial park and other experts

*Applicability*

This was achieved by clearly establishing the domain to which the case study findings can be generalized (Yin, 2002). This study though relevant to the specific case study, may be applicable to other settings with similar characteristics. This is even made more the case by comparing the chosen case to Eyde cluster whose learnings may be employed.

*Consistency (Reliability)*

This criterion required that the research results are reliable. Demonstrating that the operations of a study- such as the data collection procedures can be repeated, with the same results (Morse and Richards, 2002, Yin, 2002). Interpretations of the same data set by another investigator are expected to give the same results as stated in this study through elaborate descriptions of methods used for data collection and the resulting data set. The reasoning behind data analysis are also described clearly.

# 4 Results and Analysis

In this chapter, results from interviews and document review are presented in section 4.1 and 4.2 for findings related to Herøya industrial park and Eyde, respectively. Analysis of these findings are presented in section 4.3.

## 4.1 Results

In this section, data is organized into three major sections as follows:

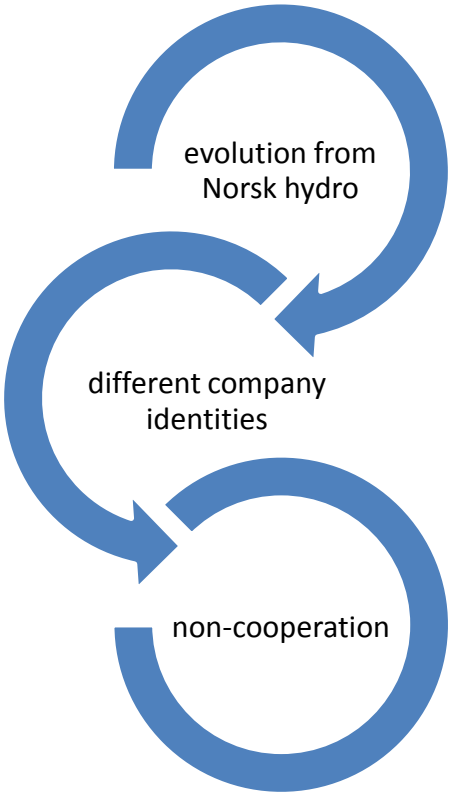
1. Existing cooperation between firms in the industrial Park
2. What factors are mitigating cooperation?
3. Promoting cooperation

Where quotes are supplied, 'S' is used to represent the *subject* of interview.[12]

### 4.1.1 Existing cooperation between firms in the industrial Park

Based on the data collected, the Fig. 8 is used to describe what remains of cooperation today at the Herøya Industrial Park, with reference to its foundation or evolution from a single company.

[12] See Appendix B on Company Groupings




*Figur 8: Evolution of cooperation in Herøya industrial park*

**Evolution from Norsk Hydro:** With reference to figure 2, Norsk Hydro is the company from which most companies represented at the Industrial evolved. The various companies split up to become various self-sustaining companies as we have it today. As a single company, it was found out that the departments worked together a lot and had knowledge of each other's competences. This is perceived from the following:

***S3*** *- 'within Norsk Hydro, there was much more cooperation because everyone could speak openly, and not be afraid of sharing any secrets.'*

***S4*** *- 'it is also important that we are so close in this industrial park…I know Tor Oscar Bolstad who is the head of the Industrial park, he was my boss from 2001-2004, so the connection here is pretty close, because we are all coming from the same company, 'Norsk hydro'….'*

***S7*** *– 'So we have gone past the journey to a commercial relationship'*

**Differing Company Identities:** Whereas this could have been a good leverage for cooperation, the companies as they are seen today, are very diversified with different identities and said to have just 'commercial relationships' for those companies who even employ services from the industrial park. Referring to an owner of one of the companies an interviewee said,

***S4*** *– '.. he is not willing to put money into the bag if it is not business for him….'*

**Non-cooperation:** Today, regarding cooperation as exists in traditional clusters, the firms at the Herøya Industrial park do not cooperate. There is the common use of public goods and infrastructure which from the quote that follows, may be exactly the reason why some companies remain in the area.

***S2*** *- '..We are located here due to the infrastructure...the benefits for the companies here is more in the usage of infrastructure…'*

No inter-firm innovations were on-going at the time of data collection.

***S1-*** *'….we are not working like a cluster…there are connections, but we do not work as a cluster when it comes to innovation, cooperation, working process, improvements, etc'*

***S2*** *– 'The traditional definition for a cluster is that the companies must participate in the same value chain…but here it is not the production that is in common…'*

***S3*** *– 'I think there has been less and less cooperation…and today, I see nothing..'*

### 4.1.2 What factors are mitigating cooperation?

The figure 9 shows a summary of the reason codes arising from data collection as responsible for the level of cooperation existing between Herøya industrial park firms and, with their prospective external partners.


*Figur 9: Factors that mitigate cooperation in Herøya industrial park*

***Lack of motivation*** for cooperation among the companies in the park has been found to be one factor that limits collaboration in the park. It was explained that, employees do not have the necessary motivation that is required for companies to cooperate. This can be seen from the following expressions.

***S1*** - *'...what is the problem is the motivation for cooperation...or lack of motivation for cooperation...'*

For companies to cooperate, there must exist some level of ***commons*** among the companies, which was found to be either low or completely lacking to a large degree in the park. It was explained that whereas other 'clusters' have a large degree of 'commons' that make it easy for the companies to work together, the industries at Herøya are wide-spread as far as their businesses are concerned. This view is demonstrated as follows:

***S1*** *- ' The industrial park has not been able to get the main agenda for a cooperation….a main topic or issue that we should base the cooperation on'*

***S9*** *-'The stability of the processes within the individual firms could be affecting the cooperation. If you think about two firms which are basically unrelated to each other due to the nature of the production process…one produces aluminium or magnesium, and the other one is fertilizers, and the third is basically solar panels, now if those three processes run parallel with very little level of interdependence between those processes, then why should we co-operate?....actually cooperation is negative'*

***S4*** *- 'just large industrial producers producing within their own walls and products…and we have a lot of service providers, but it is not all…we are not specialists in that and that…we are more general, ……it is not easy to say what kind of specialty we are really handling….'*

***S9*** *-'if you do not experience the same problems on the production line (I don't mean HR problems)….production-related problems, then why should we cooperate? In most instances, that would not add value for the companies involved….99.99% of the time'*

In line with the above point on commons, is the ***varying areas of business interests*** that exist in the industrial park. For the companies to actually cooperate, there must exist similar business interests that would make a project interesting for all who choose to partake in it. However, due to the different businesses, it follows as well that interests are also varied which makes inter-firm cooperation difficult to facilitate.

As far as ***company culture*** is concerned, the companies in the park have different company culture, missions and aims that often set them apart. This issue about company culture or the 'way things are done around here' way of thinking works against efforts to co-operate.

Within the different culture found in the companies is a common factor among some, where it is common practice to solve issues internally. Whereas these firms could have employed services of others, they are investing internally and finding solutions to their problems, which otherwise could have presented a possibility for cooperation. These companies are very innovative internally but are not solving problems across firms.

***S1-*** *'The different companies have a culture to try to fix it by themselves…they are organized to fix most of the problems inside, without the need for support or ideas from the other companies…….no culture to pick up the phone and call the maintenance manager in the company beside and ask, how do you do that? They use more external contacts than cluster contacts.'*

***Time Availability*** came up as one factor that mitigates cooperation. The companies in the Industrial park were described to be 'busy' companies that have little or no time to work on 'other' projects outside their areas of specified core business. This is the view for such companies that have very strict key performance indicators and busy day-to day schedules specified by superiors and company owners.

***S1-****'..the companies are put under much pressure from the owners, and they should focus on the cost and production and time left to work for horizontal cooperation across the companies is very little. Yara for instance has just 400 members and have very little time to work on other topics, ideas, processes and meetings.'*

It was shared also the fact on, ***newcomers and their difficult to amend processes.*** This was explained with reference to the new companies that join the industrial park, but only come with the aim of using the public goods or infrastructure available at the park, having not given a prior thought to possible inter-firm cooperations.

***Value & Benefits*** are very important to the companies in the park if they have to cooperate with others. For the companies to enter into any cooperation, there needs to be some form of 'business' benefit since the companies are there to make money. This was explicitly the case as expressed as follows:

***S3 -*** *'You will not co-operate, hire or share and risk that you lose to someone else'*

***S4 -****'…everyone must have something to gain from the projects.'*

***S9 -*** *'If you think about industrial processes where you can learn from one another, suddenly cooperation becomes more meaningful'*

***S9 -*** *'They are not cooperating not because they don't like one another, but because they don't see the added value for doing that. In other clusters where companies cooperate, the partners see potential for value creation….'*

Some companies in the park expressed the factor on the needed **competences** that are usually required for a job to be done. It was explained that, when a job had to be done, or when the opportunity for a likely cooperation arose, it usually was not a question of whether or not the prospective companies to partner with are locally- or closely-based, but rather a question of if they could actually deliver what was required. If these companies had any strong reference from

elsewhere, they would rather use it than follow after the need to work with others in the industrial park.

***S3*** *- 'Many of the people that worked here in 2004 are still here..many of them have competences that they are not working in now…from that perspective, this should be an excellent place where we could have cooperation.'*

***S3 -*** *'We have no strategy to use local companies for the sake of using them. My boss does not care if I pick someone from Norway or from elsewhere, but the focus is on competence and if they are delivering what we want.'*

***S3 -*** *'this is something that USN[13] would need to think through…..of where they would like to become champions….if you ask me they have too many areas, they are too spread…'*

***Business strategy*** making in the park for the companies does not include provisions for possible inter-firm linkages that are for the purpose of cooperation. Companies that do relate to each other do so on a customer-supplier basis and were discovered not to do so on any projects of innovative significance because their businesses, during strategy-making, overlook this. It was revealed that business strategy should include the possibility of cooperation so as to make it easier for firms in the park to collaborate.

Considering all the above factors, and imagining that they are all well dealt with, there exists in the park another factor that makes cooperation challenging to expedite. This reason which was re-echoed at various times is ***lack of decision power.*** It is an established fact that, most of the companies in the industrial park are foreign owned, or the decision making branch of the company does not sit at the Herøya Industrial Park as shown in table 1. This makes it very difficult for the company leads at Herøya, and they find themselves placed in a tight corner when decisions relating to cooperation have to be made. This is especially the case as expressed below, that the owners have no 'local feel' and often cannot appreciate the benefits of such locally-placed projects.

***S3 -*** *' You need some kind of acceptance that you work for other companies, and also you need formal clearing on which areas it is okay to do so, normally you would not co-operate on what you consider your core-competence.'*

***S4*** *- 'If you look into Grenland and the industrial park, a large number of the players in the industrial park are owned by foreign companies…the main decision makers are sitting*

[13] USN- University college in South-east Norway

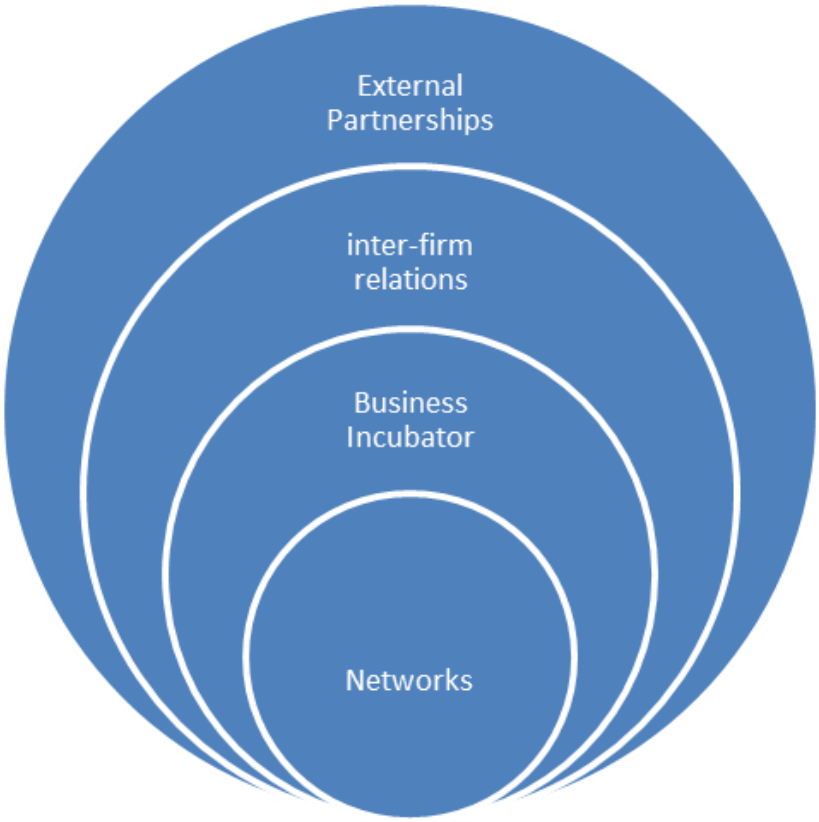
*somewhere and they have no local feeling about what is the local community or the local industrial park, and so on…'*

Table 1: Ownership of selected companies in Herøya

| Companies | Company Type | Ownership |
|---|---|---|
| Yara | Process Industry | Norwegian |
| Bilfinger | Services | German |
| Addcon | Process Industry | Russian |
| Ineos | Process Industry | United Kingdom |

### 4.1.3 Promoting cooperation

The administration of the industrial park related some experiences of failed attempts to get cooperation as a way of work for the industrial park. However, some factors were observed as positive aids to future cooperation if this is the chosen way to go in the future. These factors are shown in figure 10.




*Figur 10: Factors based on which cooperation could thrive*

Present for the involvement of the companies of the industrial park are various **networks** for employees which facilitate inter-firm interactions. Some of these networks were found to be Telemark Offshore and ICG (Industry Cluster in Grenland). It was expressed that the managers of the companies were in certain dialogues that could serve as a positive feed into any future cooperation;

***S1*** *-'…when it comes to personnel and the union…they co-operate, talk to each other, have meetings when we are discussing problems, politics in Norway are discussed…we are about 2000 employees in the ICG companies, with sales of about nok 25 billion. The government is also listening to us when we complain about our problems,.so we are working with the political part and environmental part of it.'*

***S1*** *-'The unions are a good basis for the cooperation that exists….through the meetings and discussions… the good dialogue with the unions and the unions talk very closely to each other across the companies, more than the management….there is more going on the union side'*

A **business incubator** existed with about 20 companies that were actively receiving help from various industry experts from the Herøya Industry park.

***S6*** *- ' I have with the owners and others agreement that I have time from them…so I hire experts when I need them….using money…to help the incubator…these are people from the industry here, or with a background in the industry here. The experts use some free time as contributions to the incubator…if it's a big job, then they are paid for their expertise'*

The **commercial relations** that existed between the companies of the park was indication of a not-entirely-hopeless situation, given that as and when the decision to source services from the park was possible, firms decided to do just that.

***S7*** *- 'Now we have a supplier-customer relationship….you cannot just go to that person because you know he is nice, but we have to be paid for what we deliver…and if it is not in the contract, then we have to get paid'*

These relations were also explained with regards to business development that could attract people to the industrial park for the purpose of doing business.

***S4*** *- '..if we could cooperate in a way that more customers would be established in the park, we know that the total cost would go down'*

What would be the role of competition in this case?

***S7*** *- '..competition is never dangerous. If you are looking at the competition over the yard, and every day they have a lot of customers going in there and there is no one coming here…then what are we doing wrong?'*

The **external relations** that were explored, such as the educational institution indicated a positive willingness to cooperate as and when this was possible. Also the fact that links with financial institutions already existed was indicative of support for projects that could earn such funding.

***S10****- 'We have collaboration on the level of bachelor students doing their studies, master studies, and some collaboration on PhD studies. It is with different companies…'*

Support from the educational institution

***S10****- '..from the end of last year, we have agreed on a cooperation agreement with Herøya…'*

## 4.2 A step ahead - Lessons from 'Eyde Cluster'

Table 2: Lessons from Eyde Cluster

| *Area of comparison* | *Level 1 (what was done)* | *Level 2 (what is in place)* | *Level 3 (continuous improvement steps)* |
|---|---|---|---|
| *Inter-firm linkages* | Strong networks<br><br>Gradual cooperation knowledge flow among members and regional knowledge organizations | Extensive cooperation between the core-firms in Eyde in order to transfer best practices in areas such as Lean<br><br>Strong link between Eyde Cluster, Research Institution and educational institution (strong tie with the University of Agder---- developing study programs and projects (strong R&D&I) | Agreements with NCE Raufoss + NCE Maritime Clean TECH to co-operate on relevant subjects |
| *Dealing with security* | Created trust<br><br>- Core process firms in Eyde do not compete for the same customers | Main areas of cooperation (Eyde Energy, Automation, Maintenance, HR, Lab, Lean) | - |
| *Innovation* | Individually innovative firms | Very innovative firms (for renewing and | Eyde trainee, Eyde challenge, |

| | | | |
|---|---|---|---|
| | | extension of development paths) | Eyde Leader, New Node-Eyde Women |
| *Presence of Commons* | -Common challenges<br>-Shared values & attitudes& language,<br>-approach to innovation,<br>-business sense and business culture within Eyde | Vertical and horizontal connection between cluster members (process industry companies, SMEs, R&D&I is strong, Project manager for Prosin) | - |
| *Support* | - | Support from the regional councils (Aust Agder) and Vest Agder ---(financially and participation in research programs | - |
| *Cluster constitution* | - | 27 members (companies-suppliers (technology +services)-research institution, innovation incubator, university, educational institutions) | - |

As shown in table 2, Eyde cluster was assessed in six areas namely: inter-firm linkages, dealing with security, innovation, presence of commons, support and cluster constitution. From the assessment, results emerging showed three levels of progression with regards to cooperation, specifically, what was done before attaining cluster status, what is in place, and continuous improvement steps.

## 4.3 Analysis

In this section, analysis of results has first been carried out across the individual subunits investigated, and then in relation to the industrial park as a whole (section 4.3.1). Next, findings from Eyde cluster are examined (section 4.3.2). Finally, findings from Herøya and Eyde are synthesized in order to make relevant conclusions (section 4.3.3). At each stage, results are discussed in relation to literature perspectives.

### 4.3.1 The '*unique*' case of Herøya – Non-cooperation

Herøya industrial park is unique in its on rights considering that a single company could evolve so much so that, rather than being an exemplary cooperating system, the resulting companies do not collaborate even though they are co-located. Another key that could have played an advantage is that employee relationships have lasted a long time and might have influenced the choice of prospective project partners, but this is not the case for the industrial park.

Lee et al. (2012) explained that when employees break-off from firms, they establish their new companies close to the previous one in such a way that competition and cooperation leads to the appearance of an industrial cluster (Lee et al., 2012). This background though similar to that of Herøya industrial park, where the companies have mostly evolved from *Norsk Hydro*, has not led to the formation of a cluster. It could thus be inferred that the mode of cluster appearance may be unique to location and the type of companies established at the location.

*Factors mitigating cooperation:* Across the various companies in the industrial park, factors mitigating cooperation are shared from the perception of interviewees, and agreeably have to be dealt with in the event that cooperation should be facilitated in the park. Eliminating these moderating factors may not imply sudden improvement in cooperation, but may require that further steps are taken to enhance inter-firm relations.

The *motivation* to embark on any business venture is important to the success of such a venture. While this is lacking for inter-firm cooperation in the industrial park, considering the perceived benefits of doing so, one can only ask, *why*? Motivation can be linked to the identification of opportunities to actually cooperate on a certain level, or interesting agenda which is reportedly missing in the Industrial park. This implies that, there must be a certain drive to opportunity identification. The *common* areas of collaboration, which could be in the area of *business*

*interests* and *intersections*, *company culture* and *innovative agenda* are basic for the initiation of constructive inter-firm linkages. The lack of *competence* in a firm, and the subsequent identification of its presence in another is a good incentive for companies in the park to work together. Where competence is judged to be lacking, cooperation may not be justified. Really, why would companies or firms cooperate when there is nothing to cooperate on? Emergence of the moderating effect of the absence of commons is consistent with literature propositions that firms that cooperate, do so based on the existence of ‘commons' (Newlands, 2003).

Firms cooperate when they perceive certain benefits (Hanna and Walsh, 2008). As observed from Herøya, where there exists no perceived *values and benefits*, the prospect of cooperating is unattractive, more especially in the case where *company ownership* and thus, *decision-making* is not local. Further of interest is that, *business strategy* making that does not make provisions for cooperation does not encourage inter-firm relations.

*Efforts to promote cooperation:* With the existence of mitigating factors, it is positive that there exist certain provisions that cooperation could thrive upon.

The *existing networks* of workers and unions, which reportedly enhance discourse among the firm employees is a good backbone for cooperation to be built upon. This is in line with other research findings of the benefits of firms and employees participating in networks. Networks can lead to the integration of local and social values (Ahedo, 2004).

The *business incubator* in the industrial park allows industry experts to contribute to the upcoming companies (startups) and thus is an indication of possible improvement in the existing cooperation. The incubation concept seeks an effective means to link technology, capital and know-how in order to leverage entrepreneurial talent, accelerate the development of new companies, and thus speed the exploitation of technology. Assistance in developing business plans, building management teams, obtaining capital, and access to a range of other more specialized professional services. The incubator at Herøya, which was established only 3 years ago, in addition to supplying intangible benefits through use of the industrial park’s experts, provides flexible space, shared equipment and administrative services. These services which have been identified as positive for cooperation and innovation in the entire park are consonant with work by other researchers (Rice, 2002, Grimaldi and Grandi, 2005, Aerts et al., 2007).

Existing *inter-firm relations*, though minimal would serve well for future cooperative work especially because from a commercial relationship, trust could be built. The firms that offer services to others in the park explained that trust has been built over time and through the establishment of non-disclosure agreements. McAdam and Marlow (2007) discovered that, firm proximity creates tension concerning privacy, the protection of intellectual property and competitive strategies (McAdam and Marlow, 2007). This implies that the issue of 'trust' is a concern for firms entering into collaborations and should be paid consideration.

Important to the promotion of cooperation that would benefit co-location is the existence of *external partnerships* that would augment inter-firm linkages. These external partners such as financial and educational institutions support various needs that would usually be absent within the internal ecosystem of the co-located firms. Horaguchi (2008) supports this view by explaining that though there is competitiveness in local collaborations, external players like research organizations have a key role to play to add to this competitiveness (Horaguchi, 2008).

### Eyde findings

From the Eyde example, it can be observed that the factors of cooperation could be put in three levels as seen in figure 11. While being mindful of the differing levels in factors, assessment of Eyde were also considered in six areas *inter-firm linkages, dealing with security, presence of commons, support* and *cluster constitution* shown in table 2.


*Figur 11: The progression of cooperation in Eyde Cluster*

In the *first level*, focus was placed on establishing certain factors based on which cooperation could thrive. Where these factors already existed, they were capitalized upon to initiate inter-firm cooperation. This level is resonant with the requirements of the research question, which is focused on what factors must be in place before inter-firm cooperation can be established. Important here was the existence of *strong networks and gradual knowledge flow among members and regional knowledge organizations*. This suggests that the success of Eyde took some time and patience of first establishing contacts and then, encouraging the flow of resources between them. To deal with issues of security that define limits for cooperating firms, *trust* was created. Further, the fact that *individual firms were innovative* was capitalized upon to make the value chain competitive. It was important also that the firms here had areas of *commonalities* based on which even stronger relations could be built upon.

The *second level* revealed the features of 'working' cooperation between the cluster firms of Eyde. Here, the factors in place from the first level were developed further. For example, the gradual cooperation was developed into extensive cooperation between the core-firms in Eyde in order to transfer best practices in areas such as Lean. As far as security was concerned, the precise areas of cooperation were specified (e.g. Main areas of cooperation -Eyde Energy, Automation, Maintenance, HR, Lab, Lean).

The *third level*, on continuous improvement, revealed that establishing cooperation is not an end of the process, but requires even more work to maintain and improve existing relations. This is shown through the existence of 'agreements with NCE Raufoss and NCE Maritime Clean TECH' to collaborate on relevant subjects and 'Eyde trainee, Eyde challenge, Eyde Leader, New Node-Eyde Women' programs in the areas of inter-firms linkages and innovation, respectively.

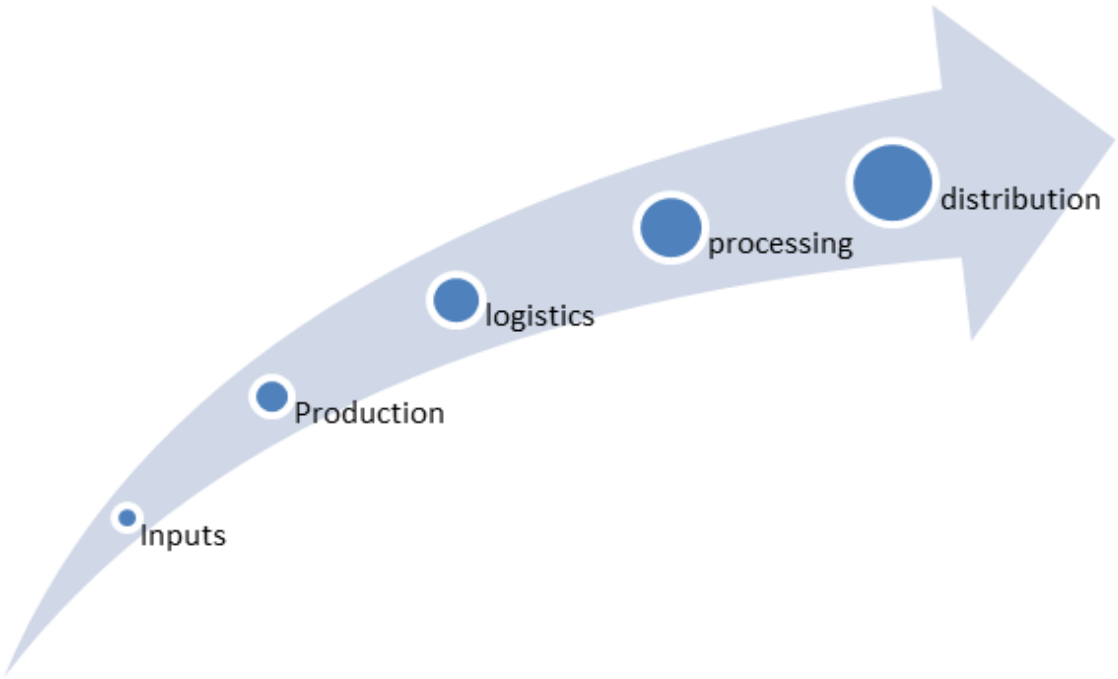
These three levels identified from Eyde, are reminiscent of Atherthen's (2003) proposal of three stages of cluster development, namely; potential, emerging and established (Atherton, 2003). The findings on the first level are consistent with the mitigating factors of cooperation in the Herøya industrial park. While this may not be the case in all circumstances, this leads to the realization that, when certain mitigating factors to cooperation are removed, there could be more benefits towards inter-firm cooperation in the Herøya Industrial park. The point on the existence of commons emphasizes this very well.

### 4.3.2 Synthesis of Results – looking forward with the hope to cooperate

*'I have 200 employees- yet 3000 co-players'*

The above quote, by *Lars Petter Maltby – (Saint Gobain CM)* of the Eyde cluster, lends very well to the traditional understanding of the role of cooperation for co-located firms. Whereas attention could be paid to only the key processes of a given company, it is indeed important to consider the benefits of greater gain that could exist in exchange of knowledge between firms in such a way that, these firms could actually be termed co-players.

The companies in Herøya could look forward with the hope to cooperate considering that, the systems and provisions that need to be in place are established. Public goods are considered a given in this case, because the infrastructure of the location is advanced and available to all companies who wish to benefit from them. Feeding off a traditional definition of clusters, the firms in a place should constitute producers, suppliers, research institutions (R&D), educational institutions and support institutions (e.g. financing) for firms to consider cooperating in a cluster setting which is the case for Herøya. The mitigating issue here however is that, the Industrial Park, though constitute of various types of the required cluster firms, does not identify in the same value chain which would have been a good basis for cooperation. An example of a typical value chain is shown in figure 12.




*Figur 12:Value chain of cluster firms*

Identifying in the same value chain has some dependence on commonalities that exist between the firms. The firms in this Industrial park are dispersed across industry types and specifications that, finding an agenda or basis for cooperation eludes the proponents of cooperation in the park. In comparison with typical clusters of automation, leather and IT, Herøya has companies that deal in very specific areas in such a way that the companies have been described as each working in their silos by a common supplier.

*S4..'if you talk to Ineos, they have no cross-board projects with yara and…we are working between them, but they are working in their own silos'*

The Industrial park can also boast of important external linkages that would enhance cooperation; with educational institutions both in the area and outside, financial institutions and strong research institutions. Hereto, the needed commitments that are often required to seal-off inter-firm agreements are often lacking which fights against cooperation.

*S10..'we did not have enough decision makers from these companies that were interested with us…this brings us back to the fact that if we have a representative in a work group who does not have the authority to commit work for that company, then you cannot get too specific…you get stuck on the level of intentions'*

Further, there is high innovation in the Industrial park which could be a source of future co-operative projects. This level of innovation that could lead to possible cooperation is enhanced with the perceived benefits that the employees see in cooperation.

*S1:..'the automization, the improvements in the industrial park have been extreme from the 70's and up to date'*

Lessons from the Eyde cluster imply that, at the stage of collaboration in the Herøya Industrial park, it is important to do the following:

1. build strong networks to enhance gradual cooperation
2. create trust and avoid competition between core process firms in the Industrial park
3. encourage innovation in the individual firms and,
4. capitalize on commons

There is the existence of external networks and internal linkages as far as building strong networks is concerned, and the individual firms in the industrial park are innovative on their

own. These points as have been explained, are a good leverage for collaboration between the parks firms to be established.

From the Eyde cluster, it was found that there is the need to build trust. This is corroborated through the interviews at Herøya that trust is what firm-supplier relations thrive on. However, it is quite uncertain if complete avoidance of competition among the core process firms as practiced in Eyde cluster, is the way to go for Herøya as well. Based on literature findings, competition may actually go hand-in-hand with cooperation and be a promoter of innovation and productivity (Newlands, 2003, Porter, 1998, Ginsberg et al., 1998, Weidenfeld et al., 2014, Wu and Xu, 2008, Harrison, 1992). On the issue of competition, varying views have been discovered in Herøya as well, as portrayed as follows:

*S3- 'the owners of the research park must really think about it before they let someone new enter….how would that new partner in a way affect the symbiosis of the rest of the team? In bringing certain companies could open up and stimulate more innovation..but if you bring in competitiors, you can risk that the opposite is happening'*

*S7- 'Competition is never dangerous..the competition would be somewhere anyhow, and it is better that the competition are here…if you are looking at the competition over the yard, and every day they have  a lot of customers going in there and there is no one coming here…then you ask yourself what are we doing wrong?'*

The above varying views from a process industry and a supplier firm, respectively, imply that competition in itself may not be negative, but may be more rewarding for some type of firms than others. This inference could be further investigated to derive better understanding of the role of competition, specific to Herøya.

The importance of the presence of commons for firm collaboration as arising from Eyde, shown in table 2, is merely an echo of what literature posits. This is important for identifying in what areas firms could work together. As earlier shown, the firms in Herøya attest to the importance of the presence of commons, but it remains a challenge when it comes to identifying the particular area for cooperation.

### 4.3.3 What must be in place to promote inter-firm cooperation?

Reviewing the data in relation to the research question, and from comparison with Eyde, an attempt to suggest what must be in place for firms to benefit from cooperating in the same location, would suggest the following as specific to the case of Herøya:

1. Existence of commons
2. Ability to decide
3. Existence of trust

These three factors are considered all-encompassing as far as the other arising factors are concerned, or in other words, the other findings could be grouped under these three factors. Existence of commons in this context includes common business interests and values, business sense and culture. Ability to decide is proposed in attempt to satisfy the mitigating factor of firms' inability to decide on projects of innovation because their decision seats are located in other countries. Also, for whatever opportunity that arises for collaboration, there should be trust, based on which relations can be built and productivity enhanced. From their study, Li and Geng (2012) attest to the importance of mutual trust in enhancing firm productivity (Li and Geng, 2012).

Yet, transcending this way of thinking, of merely stating factors is the following consideration: even if cooperation could be initiated for Herøya firms, *what would be the end result of these relations?* From literature, benefits from the cooperation between co-located firms have been discussed in relation to competitiveness showing that inter-firm cooperation should lead to a competitive advantage (Porter, 1998, Boschma, 2004). It has also be shown that, the prospect of enhancing competitive advantage is a consideration before firms decide to network (Hanna and Walsh, 2008). For this reason, it is important to briefly consider the impact that cooperation in Herøya would have on competitiveness. This would be done by reviewing results along the concepts of perceived effectiveness of relations, win-win relations and sustainable relations.

#### *Perceived Effectiveness of Relations*

So far in this thesis, it has been established that in one way or another, firms benefit when they relate to each other. Though this may not always be possible in the same value chain, firms must none-the-less have some dependence on one another for what they cannot do for themselves. Considering this, the effectiveness of a perceived relation is a key consideration.

For a relation to be effective, it must lead to increased competitiveness for the firms involved rather than make them less competitive. Further, these relations should lead to increased contribution from external players as well as give an increased synergistic effect. The relation must not be individually rewarding, but for the entire chain of firms involved (Chertow and Miyata, 2011). The following quotes are consistent with the above idea on effectiveness of relations.

*S7 – 'It's not enough to get a good cooperation if everyone is on the same line, one needs to be in front, take the lead, and in other areas it could be other companies, who have to take the lead….depending on really what their business is'*

*S10 – 'we agreed to add this to the curricular of our mechanical engineers, and did not have the competence ourselves, and so decided to hire someone from a company using these standards, on a part time basis, 2 hours lectures…4 weeks to offer the extra curriculum to the students….this illustrates how we are interacting with the region.'*

From the above, it can be seen that perceived effectiveness of prospective relations is an important consideration. It is not enough to identify in a collaboration that would not be effective. The relations must be organized well depending on the specific projects at hand. If there is no project lead, the collaboration may not be effective. Further, firms must be willing to go an extra mile to gain extra competence. This is exemplified in the case of the university college in Porsgrunn, USN, who adjust their curriculum when possible to make them more exciting partners for collaborations.

### *Win-Win relations*

When an overall outcome of inter-firm relationships is effective, but individual participants in the relation are not rewarded, the situation is not 'win-win' for all, and this could eventually lead to a 'lose' scenario for all. Companies do not relate with each other just for the purpose of doing so, but rather to obtain certain benefits they would otherwise not experience were they to practice otherwise (Felzensztein et al., 2012, Hanna and Walsh, 2008). Further, if the firms lack shared objectives, or fail to identify these, then benefits inherent in cooperating would be elusive. This implies that, encapsulating the findings of the existence of various commonalities is the expectation that relations would benefit all players alike, in relation to what they

contribute to the relationship. Findings from interviews, as shown below, support the literature perspectives on the importance of win-win relations.

*S9 - 'The companies do very well…without the cooperation….these companies may well be in alliances with other institutions outside Herøya where value is created.. the 'intra-cluster alliance should not be forced'*

*S9 – 'If u think about industrial processes where you can learn from one another, suddenly cooperation becomes more meaningful'*

### *Sustainable relations*

For firms to benefit from co-location, the relations must be sustainable and able to be strengthened across value chains and individual relating firms. This implies that, *trust* must be existent between the firms which is tried and tested with time. Further, the sustainability of relations requires that firms think beyond what they offer today, and consider the future as well. From the quote below, it is argued that a firm must not choose a partner who would serve them for their present products services alone, but who would prove beneficial for an extended line of services in the future, and hence the idea of sustainability.

*S10 –'If you want to develop an area, then you must have competent personnel to make sure the companies in the area have access to such people, and also try to contribute that more companies join in and choose this idea to develop the product…1)Do we just make product A and sell it, or 2) yes we develop product A and sell it, but we need to think about tomorrow and must develop product A to B , because otherwise, we may get out of business…There are several companies in this area who stop at level 1…students can cooperate on level 2'*

# 5 Conclusions

## 5.1 Key Conclusion

The aim of this study was to explore non-cooperation in Herøya industrial park in order to examine factors that must be in place for firms to benefit from co-location. Firms in the Industrial park have a very good basis to cooperate like other traditional clusters, however, based on this study they seem not to be presently disposed to establishing the level of inter-firm linkages characteristic of 'working' clusters.

Findings from Herøya, and lessons from Eyde, indicate that the provisions that have to be made for the firms to benefit from cooperating in the location are not far-fetched. The existence of commons, ability to decide on available options and trust built over time were discovered to be important for cooperation-related benefits to be derived.

Having discovered these factors, the following question was considered, *'Can the provision of these factors be afforded?'* From the findings of this study, firms in the Herøya park are profitable on their own, hugely owing to the fact that they have innovation done internally which makes them some-what self-sufficient. Where other firms, would have had the opportunity to contribute, these firms have invested into solving their problems internally. They have time restrictions and foreign owners who do not appreciate the need for local cooperation. And even if the factors of commonalities, decision power and presence of perceived values are actually in place, would these lead to increased competitiveness of the region? Would these relations be effective, 'win-win' or sustainable?

These companies are clustered in the same location for the purpose of using infrastructure, but do not seem to have major business intersections that would excite joint 'innovative' projects together. Cooperating is not completely impossible for the industrial cluster, however, learnings from this study indicate that the moderating factors need to be overcome to make such an endeavor effective, beneficial and sustainable for all participating firms. To promote cooperation in the Herøya industrial park, it is recommended that firms should actively build on the existing internal and external relations and employ the use of effective communication to enhance possible future collaborations that would have a positive impact on competitiveness.

Based on the findings and discussions of this study, it follows that firms in the Herøya industrial park should not be compelled into collaborating given that at present, firms perceive no benefit in doing so.

## 5.2 Limitations and Implications of research

A huge repertoire of research on clusters and agglomerations exist. However, little has been found on their stage of emergence, with focus on what promotes this emergence. In this research, factors that must be in place for firm collaboration and ultimately cluster formation have been explored using a rather interesting case of non-cooperation. The point is however brought home by comparing to a 'working' cluster in which cooperation is predominant.

Using this approach reveals that, though the existence of commons, decision power and perceived benefits and values are important, these should lead to effective, beneficial and sustainable relations to promote competitiveness. Even with certain comparable factors like those found in other cluster setups, this research goes to show that, *what works for one cluster location may not always work for another*.

The study is however limited by the fact that it is case-specific and thus findings may not be generalized to different setups. However, this limitation is moderated by the comparison with another cluster, Eyde.

Suggesting hypotheses to guide further research on this topic would be the following as consistent with findings, where these propositions should ultimately lead to an increased level of competitiveness not only for the firms involved, but for the entire region they are located in. To benefit from co-location,

P1: firms must share some 'commons' to be able to cooperate and benefit from co-location *(these commons cut across business interests, company values and cultures)*
P2: the firms, should have the ability to decide or make commitments that are related to the area of cooperation *(with the needed support from top management of their firms)*
P3: inter-firm trust must exist based on which perceived values and benefits could be gained
P4: firms must copete given the assumption that, both cooperation and competition go hand-in-hand.

The above propositions are chosen because they answer the research question of ‘what factors must be in place for firms to benefit from co-location’. The fourth proposition though not clarified from the research findings, is added for further investigation. In the event that future research is aimed at probing ‘why co-located firms co-operate?’, propositions regarding competitiveness (effective, beneficial and sustainable relations) could be considered.

# References


AERTS, K., MATTHYSSENS, P. & VANDENBEMPT, K. 2007. Critical role and screening practices of European business incubators. *Technovation,* 27**,** 254-267.

AHEDO, M. 2004. Cluster policy in the Basque country (1991-2002): Constructing 'industry-government' collaboration through cluster-associations. *European Planning Studies,* 12**,** 1097-1113.

ATHERTON, A. 2003. Examining clusters formation from the 'bottom-up': analysis of four cases in the North of England. *Environment and Planning C-Government and Policy,* 21**,** 21-35.

BATTAGLIA, M., BIANCHI, L., FREY, M. & IRALDO, F. 2010. An Innovative Model to Promote CSR among SMEs Operating in Industrial Clusters: Evidence from an EU Project. *Corporate Social Responsibility and Environmental Management,* 17**,** 133-141.

BENNEWORTH, P. & HENRY, N. 2004. Where is the value added in the cluster approach? Hermeneutic theorising, economic geography and clusters as a multiperspectival approach. *Urban Studies,* 41**,** 1011-1023.

BOSCHMA, R. A. 2004. Competitiveness of regions from an evolutionary perspective. *Regional Studies,* 38**,** 1001-1014.

BRENNER, T. 2005. Innovation and cooperation during the emergence of local industrial clusters: An empirical study in Germany. *European Planning Studies,* 13**,** 921-938.

BRITTON, J. N. H. 2003. Network structure of an industrial cluster: electronics in Toronto. *Environment and Planning A,* 35**,** 983-1006.

CHERTOW, M. & MIYATA, Y. 2011. Assessing Collective Firm Behavior: Comparing Industrial Symbiosis with Possible Alternatives for Individual Companies in Oahu, HI. *Business Strategy and the Environment,* 20**,** 266-280.

DIEZ-VIAL, I. 2011. Geographical cluster and performance: The case of Iberian ham. *Food Policy,* 36**,** 517-525.

ERIKSSON, R. & LINDGREN, U. 2009. Localized mobility clusters: impacts of labour market externalities on firm performance. *Journal of Economic Geography,* 9**,** 33-53.

FELZENSZTEIN, C., GIMMON, E. & AQUEVEQUE, C. 2012. Clusters or un-clustered industries? Where inter-firm marketing cooperation matters. *Journal of Business & Industrial Marketing,* 27**,** 392-402.

GINSBERG, A., LARSEN, E. & LOMI, A. 1998. *Where do industrial districts come from? A cellular automata model of competition, cooperation and the dynamics of industrial clusters,* Godalming, Springer-Verlag London Ltd.

GIULIANI, E. 2011. Role of Technological Gatekeepers in the Growth of Industrial Clusters: Evidence from Chile. *Regional Studies,* 45**,** 1329-1348.

GRAF, H. 2011. Gatekeepers in regional networks of innovators. *Cambridge Journal of Economics,* 35**,** 173-198.

GRETZINGER, S. & ROYER, S. 2014. Relational resources in value adding webs: The case of a Southern Danish firm cluster. *European Management Journal,* 32**,** 117-131.

GRIMALDI, R. & GRANDI, A. 2005. Business incubators and new venture creation: an assessment of incubating models. *Technovation,* 25**,** 111-121.

HAMMARBERG, K., KIRKMAN, M. & DE LACEY, S. 2016. Qualitative research methods: when to use them and how to judge them. *Human Reproduction,* 31**,** 498-501.

HANNA, V. & WALSH, K. 2008. Interfirm cooperation among small manufacturing firms. *International Small Business Journal,* 26**,** 299-321.

HARRISON, B. 1992. INDUSTRIAL DISTRICTS - OLD WINE IN NEW BOTTLES. *Regional Studies,* 26**,** 469-483.

HILL, E. W. & BRENNAN, J. F. 2000. A methodology for identifying the drivers of industrial clusters: The foundation of regional competitive advantage. *Economic Development Quarterly,* 14**,** 65-96.

HOEKMAN, J., FRENKEN, K. & TIJSSEN, R. J. W. 2010. Research collaboration at a distance: Changing spatial patterns of scientific collaboration within Europe. *Research Policy,* 39**,** 662-673.

HORAGUCHI, H. H. 2008. Economics of reciprocal networks: Collaboration in knowledge and emergence of industrial clusters. *Computational Economics,* 31**,** 307-339.

ISAKSEN, A. & ONSAGER, K. 2010. Regions, networks and innovative performance: The case of knowledge-intensive industries in Norway. *European Urban and Regional Studies,* 17**,** 227-243.

KITTO, S. C., CHESTERS, J. & GRBICH, C. 2008. Quality in qualitative research. *The medical Journal of Australia,* 4**,** 243-246.

KNOBEN, J., ARIKAN, A. T., VAN OORT, F. & RASPE, O. 2016. Agglomeration and firm performance: One firm's medicine is another firm's poison. *Environment and Planning A,* 48**,** 132-153.

KOWALSKI, A. M. & MARCINKOWSKI, A. 2014. Clusters versus Cluster Initiatives, with Focus on the ICT Sector in Poland. *European Planning Studies,* 22**,** 20-45.

KUKALIS, S. 2010. Agglomeration Economies and Firm Performance: The Case of Industry Clusters. *Journal of Management,* 36**,** 453-481.

LEE, I. H., LEVESQUE, M. & MINNITI, M. 2012. Employees' Break-offs and Location Selection: The Birth of Industrial Clusters. *Ieee Transactions on Engineering Management,* 59**,** 278-292.

LI, J. & GENG, S. 2012. Industrial clusters, shared resources and firm performance. *Entrepreneurship and Regional Development,* 24**,** 357-381.

MARTIN, R. & SUNLEY, P. 2003. Deconstructing clusters: chaotic concept or policy panacea? *Journal of Economic Geography,* 3**,** 5-35.

MCADAM, M. & MARLOW, S. 2007. Building futures or stealing secrets? Entrepreneurial cooperation and conflict within business incubators. *International Small Business Journal,* 25**,** 361-382.

MORRISON, A. & RABELLOTTI, R. 2009. Knowledge and Information Networks in an Italian Wine Cluster. *European Planning Studies,* 17**,** 983-1006.

MORSE, J. M. & RICHARDS, L. 2002. *Readme First for a User's Guide to Qualitative Methods.,* Thousand Oaks, London, New Delhi, Sage.

MOTOYAMA, Y. 2008. What Was New About the Cluster Theory? What Could It Answer and What Could It Not Answer? *Economic Development Quarterly,* 22**,** 353-363.

NEWLANDS, D. 2003. Competition and cooperation in industrial clusters: The implications for public policy. *European Planning Studies,* 11**,** 521-532.

PENG, D. J. 2007. Industrial clusters in Asia: analysis of their competition and cooperation. *Annals of Regional Science,* 41**,** 495-497.

PORTER, M. E. 1998. Clusters and the new economics of competition. *Harvard Business Review,* 76**,** 77-+.

RICE, M. P. 2002. Co-production of business assistance in business incubators - An exploratory study. *Journal of Business Venturing,* 17**,** 163-187.

SANDELOWSKI, M. 1986. The Problem of rigor in quality research. *Advances in nursing science,* 8**,** 27-37.

SAXENIAN, A. 1994. LESSONS FROM SILICON VALLEY. *Technology Review,* 97**,** 42-51.

SHAVELSON, R. & TOWNE, L. 2002. *Features of education and education research. Scientific research in education.,* Washington, DC, National Academy Press.

SOETANTO, D. P. & JACK, S. L. 2013. Business incubators and the networks of technology-based firms. *Journal of Technology Transfer,* 38**,** 432-453.

WEIDENFELD, A., WILLIAMS, A. M. & BUTLER, R. W. 2014. Spatial competition and agglomeration in the visitor attraction sector. *Service Industries Journal,* 34**,** 175-195.

WILSON, J. R. 2014. *Essentials of Business Research, A guide to doing you research project,* London, SAGE publications Ltd.

WU, X. B., GENG, S. A., LI, J. & ZHANG, W. 2010. Shared Resources and Competitive Advantage in Clustered Firms: The Missing Link. *European Planning Studies,* 18**,** 1391-1410.

WU, X. J. & XU, J. 2008. *Study on the competition or cooperation mechanism of industrial cluster,* Liverpool, World Acad Union-World Acad Press.

YIN, R. K. 2002. CASE STUDY RESEARCH - Design and Methods. London: Sage Publications.

# Appendix A – Interview Guide

| *No* | *Question prompts* | *Purpose of question prompt* | *Time information is gathered* |
|---|---|---|---|
| Qp. 1 | Demographics:<br>a) -Name of company<br>b) -type of company (producer, supplier, etc)<br>c) Name of contact person<br><br>Organization of the industrial Park | Enable sampling across all the company types and desired source of information | Before Interview |
| Qp. 2 | Existing cooperation between firms in the industrial Park<br>a) Is there any existing co-ordination between this firm and others in the park?<br>b) Why is this the case? (for both yes and no answers to a))<br>c) Has there been any co-ordination in the past? How did it go? Passed? Failed? (for yes answers)<br>d) For the companies you co-ordinate with, are these within or outside the Industrial park? What type of companies are these?<br>e) For companies that co-ordinate with others outside the industrial park, ask Why these companies? Are those expertise lacking outside the industrial park? | To understand the presence or absence of cooperation among the Industrial park firms, and appreciate why this is the case? | During interview |

| | | | |
|---|---|---|---|
| Qp. 3 | Promoting cooperation<br>a) For the existing level of inter-firm cooperation in the Industrial Park, what do you believe is lacking?<br>b) Will cooperation with other companies in the park benefit your firm?<br>**c) What must be put in place to make this picture 'better'?**<br>d) Why do you think these 'factors' would promote cooperation? | Assess the factors that are mitigating cooperation and appreciate factors that must be put in place to make this picture better, i.e to make cooperation happen<br><br>Assess if cooperation is the way to go, and if it could ever happen for firms in this industrial park? | During interview |
| Qp. 4 | Evolution of the state of cooperation in the cluster?<br>a) How do companies in this cluster work together?<br>b) Has this always been the case?<br>c) What exactly was done to improve cooperation among cluster firms?<br>d) What factors do you think work against inter-form cooperation?<br>e) What initiatives are you putting in place to promote this inter-firm cooperation even further? | A means to compare Herøya with other similar setups that seem to be 'a step or so ahead' to assess if some initiatives can be adapted and helpful to Herøya. | During interview (with Clusters/networks of comparison) |
| Qp. 5 | Other comments and the wayforward | Opportunity to gather any | During interview |

| | | | |
|---|---|---|---|
| | | lagging information. | |

# Appendix B – Company Groupings

| Firm/Institution | Code | Criteria for involvement in Research |
|---|---|---|
| (Herøya Industrial Park AS) HIP | S1 | Administration of the Industrial Park |
| HIP | S2 | Business Strategy |
| Yara | S3 | Process Industry company |
| Bilfinger | S4 | Largest Supplier of technical services |
| Molab | S5 | Supplier of Analytical and scientific services |
| Proventia | S6 | Incubator |
| Evry | S7 | Supplier of IT services |
| Acona | S8 | Very small and new company (Mathematical simulations, etc – supplier) |
| BI Advisor | S9 | Expertise *(having studied cluster effect in Grenland and herøya industrial park)* |
| HSN | S10 | Educational |
| Eyde | S11 | Network of comparison |

# Appendix C – HSN competence

HSN/Tel-Tek: Pilot plant relevant competence

| | Competence | Description |
|---|---|---|
| 1 | Cost Estimation | Speciality for early phase; concept evaluation |
| 2 | Chemical engineering Design | M&E balance, Apparatus calculations |
| 3 | Solids handling | Erosion, segregation, dusting, scale formation |
| 4 | Chemistry | Inorganic, organic, physical, etc |
| 5 | Thermodynamics | - |
| 6 | Fluid flow | CFD++ |
| 7 | Instrumentation & Process control | Several modelling tools |
| 8 | Process modelling and optimization | Simulation tools: ASPEN, ASPEN PLUS |
| 9 | P&ID analysis | - |
| 10 | HAZOP | - |
| 11 | Operation of process plants, trouble shooting | - |
| 12 | Data treatment | Statistics, regression, multivariate analysis, data reconciliation |

# Appendix D –Secondary document reviewed

| Name of Document | Type / source of document | Summary of Information Gathered |
|---|---|---|
| NCE Eyde –World Leading Cluster for Sustainable Process Industry | Report /Eyde cluster | This document was authored when Eyde network was seeking to be upgraded to cluster status. In this document, systems that were put in place for a successful upgrading were explained. |
| From a business network to an innovative cluster in a national innovation system | Study / Eyde cluster | Explains what types of innovations and innovation methods typify the cluster, and what kind of innovation systems EYDE takes part in |
| Herøya industrial park | Presentation / Herøya industrial park as | An overview of the organization of Herøya from a business strategy perspective |
| 'Et Kunnskapsbasert Grenland' (A knowledge-based Grenland) | Report by Amir Sasson/ Herøya industrial park as | Studies cluster effect in Herøya industrial park and establishes that firms do not cooperate, confirms that Herøya is not a cluster |
| 'Innovasjonssamarbeid mellom bedrifter og forskning-den norske modellen' (Innovation Cooperation between enterprises and research-Norwegian model) | Book/ Herøya industrial park as | Describes in chapter 10, some history of Herøya and present collaborations and networks existing in the Grenland area |
| Proff download | www.proff.no | Information on firms in and around herøya regarding leadership (managers), web and street addresses, employee count  income (profitability) |

| | | |
|---|---|---|
| ‘Herøya Industripark’ (Herøya Industrial Park) | Website (http://www.heroya-industripark.no/) | Information on evolution of Norsk Hydro, facts about firms and news about government interest |